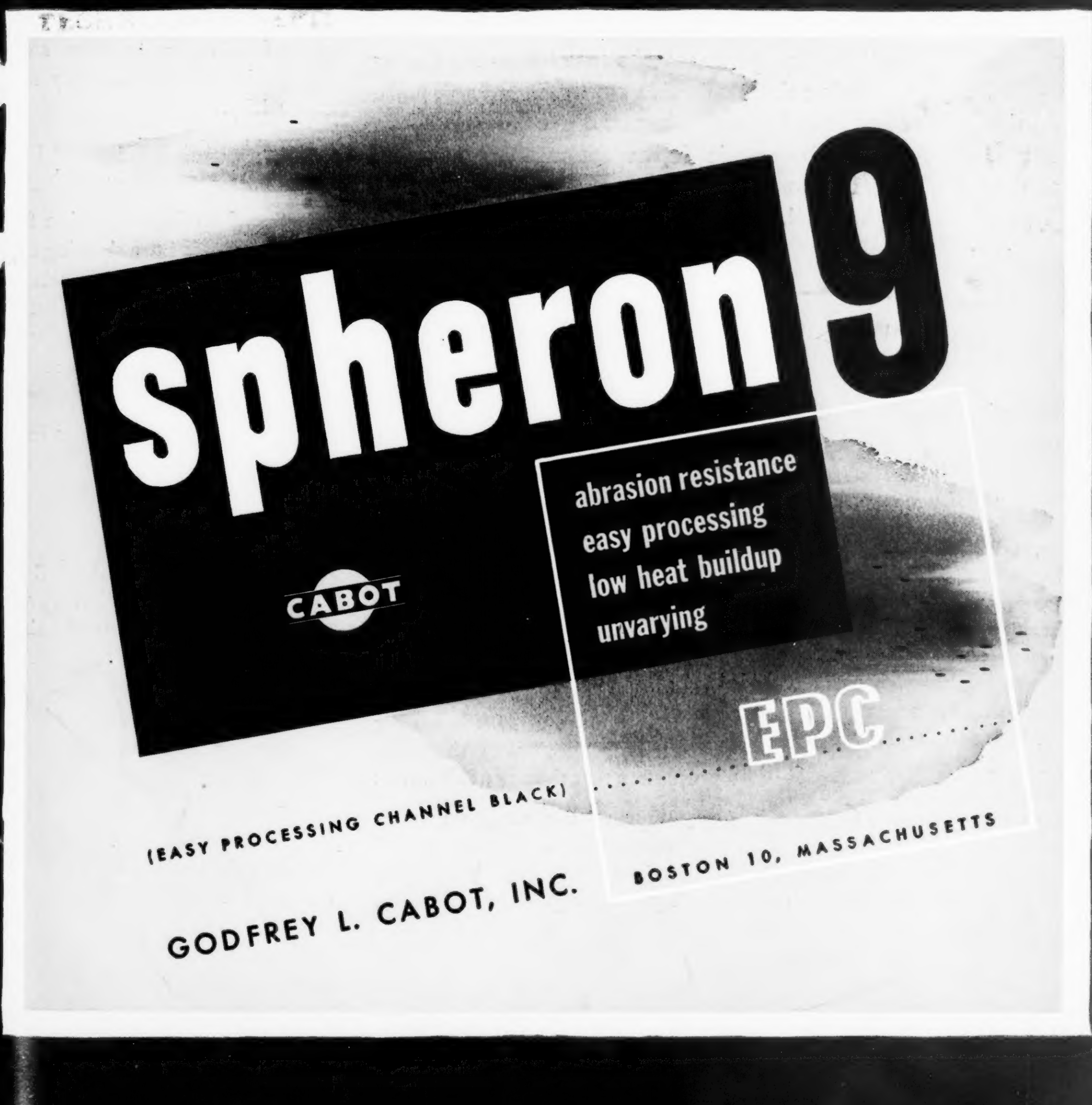
INDIA RUBBER WORLD

NTHETIC

AUGUST, 1946



Du Pont
NEWSLETTER No. 8, AUGUST 1946
RUBBER CHEMICALS DIVISION
PUBLISHED BY E. I. DU PONT DE NEMOURS & CO. (INC.), WILMINGTON 98, DELAWARE

FACTORY EXPERIENCE CONFIRMS BENEFITS OF ELA, ELASTOMER LUBRICATING AGENT

ELA, a pale yellow liquid, was introduced in the spring, and since that time has been tried by many rubber manufacturers. Their experience has confirmed the fact that ELA reduces the tendency of rubber, GRS, butyl and neoprene stocks to stick to mill rolls without adversely affecting their cohesive strength and self tack. In addition, the use of ELA has a number of other advantages. It is believed that its effectiveness is dependent upon a chemical rather than a physical action and thus it represents an entirely new type of rubber chemical.

Methods of Use

Factory experience indicates that there are two general methods of using ELA:

1 Added to the stock.
2 Rubbed on the mill or calender roll.

The use of up to 2% of ELA does not affect either the curing rate or the aging characteristics of a basic rubber, GRS or neoprene stock. For butyl, we do not recommend the use of more than 1% of ELA.

When ELA is added to a stock it is most effective when introduced as close as possible to the point in the processing cycle where sticking occurs. When it is used in highly loaded stocks there is a tendency to lose effectiveness either on long milling or long storage of the uncured stock.

When it is desirable to apply ELA to the mill roll rather than the stock, it is suggested that a thin coat be applied to the roll by wiping with a rag moistened with ELA.

Factory experience has indicated that while the material is non-toxic and does not cause dermatitis, excessive contact with the skin can cause localized dehydration with subsequent peeling. For this reason, the use of gloves is recommended when wiping rolls with ELA.

Plus Values from ELA

In addition to its primary purpose of preventing sticking to the rolls, reports from our customers indicate that the use of ELA has other advantages. Specifically these reports state that the use of ELA will:

1 Improve the surface appearance of the sheeted stock and help to prevent blistering or air checking.
2 Lead to the easy production of calendered sheets of uniform gauge particularly in the case of thin gauges from stocks which have a tendency to be sticky.
3 Widen the temperature range for successful calendering.
4 Speed up the conversion from a frictioning to a sheeting operation where a single calender is used for both purposes. It is suggested that ELA be applied directly to the middle roll for this purpose.
5 Function as a lubricant in extruding operations, facilitating the flow of the stock through the machine.
6 Assist in cleaning tubing machine heads and dies. For this purpose it is suggested that a small quantity of ELA be brushed over the inside surface of the head and die before the run is started.

For more information on ELA write for our Technical Bulletin BL-210.

DU PONT
BETTER THINGS FOR BETTER LIVING . . . THROUGH CHEMISTRY

INDIA RUBBER WORLD, August, 1946, Vol. 114, No. 5. Published Monthly by BILL BROTHERS PUBLISHING CORP. Office of Publication, Orange, Conn., with Editorial and Executive Offices at 386 Fourth Avenue, New York 16, N. Y., U. S. A. Entered as Second-Class Matter at the Post Office at Orange, Conn., under the act of March 3, 1879. Subscription, United States and Mexico, $3.00 per Year; All Other Countries, $4.00; Single Copies 35 Cents. Address Mail to New York Office.

HOT STUFF...

SURE NUFF!

but no scorch with Philblack A

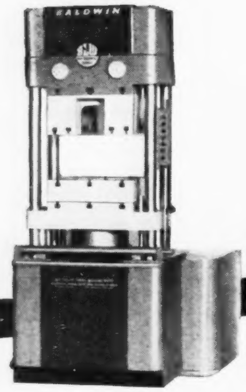
In a hot spot with your production? Let Philblack A help you out. Because Philblack A has a marvelous facility for ironing out processing troubles. Easy processing—and how! Cooler, faster, smoother tubing and mixing. **Maybe it's hot tensile** you're after? Then how's this for high? At 200°F. you get far greater tensile strength with Philblack A, than with easy processing channel blacks. **Tire manufacturers** who use Philblack A know that it also gives better resistance to cuts, cracks and abrasion. Tires stand up well under severe high temperature operation.

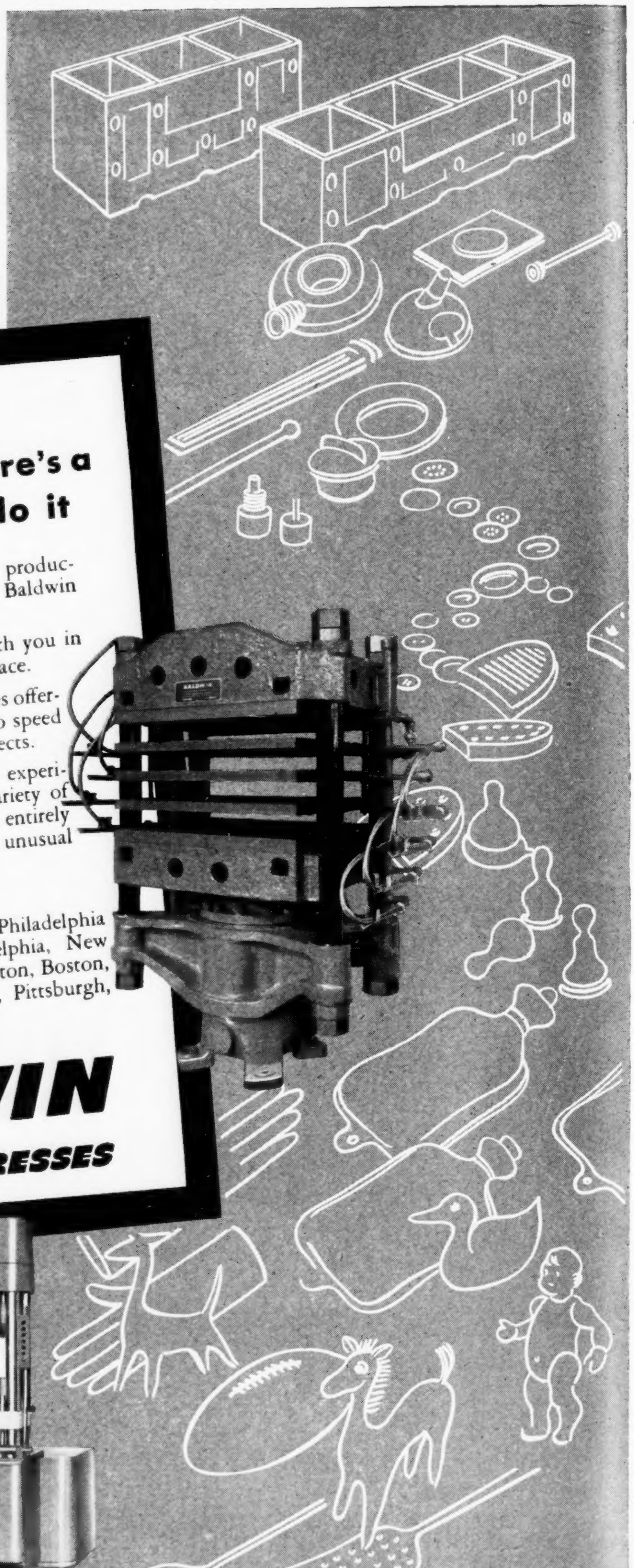
PHILLIPS PETROLEUM COMPANY

Philblack Division

EVANS SAVINGS AND LOAN BUILDING • AKRON 8, OHIO


GOOD-RITE
ERIE
an outstanding accelerator for
low heat build-up in
compounding GR-S and natural rubber





BLH
THE BALDWIN GROUP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OUT OF Chaos
That was the result when, early in this century, we promoted systematic grading and specifications for
SCRAP RUBBER
WE ARE STILL MAINTAINING
Leadership Through Ability and Stability
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& CO. INC.
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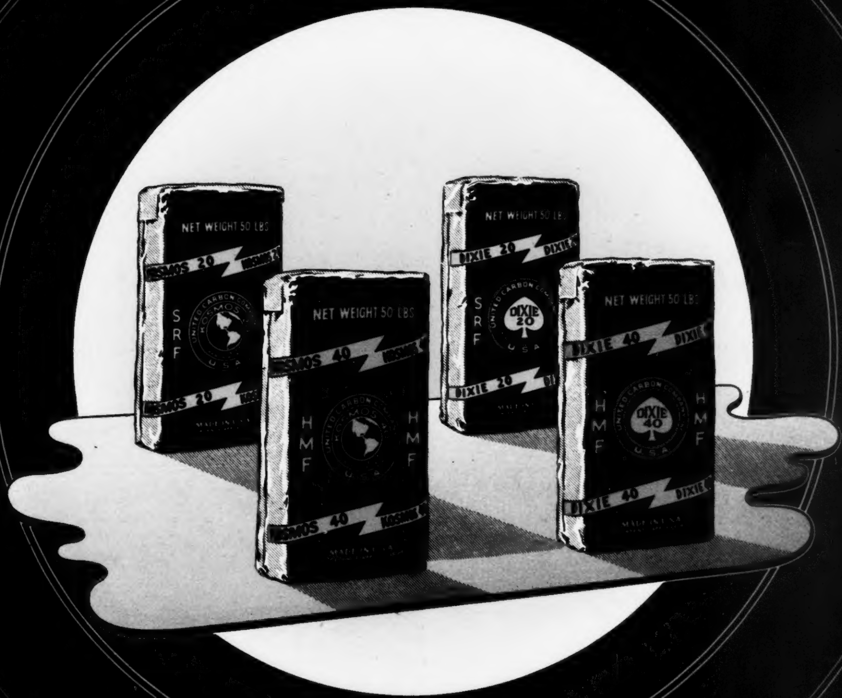

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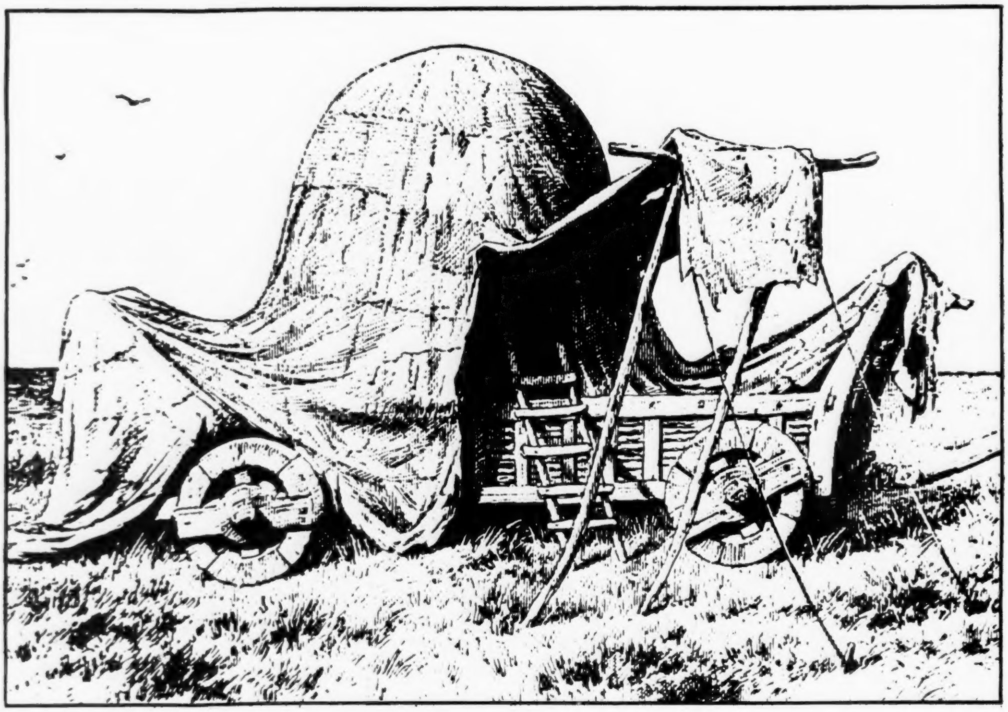



Reagents
B&A
STANDARD OF PURITY
Fine Chemicals



John Barrymore
and Mary Astor
"DON JUAN"
August 6, 1926

Technical Bulletin No. 24 on the Compounding of GR-S with Substantial Loadings of Zinc Oxide

Experimental GR-S Polymer "X-141" *(The Isoprene-Styrene Polymer)* with 100 Parts of Zinc Oxide

"X-141" is defined as follows by the *Office of Rubber Reserve:* "GR-S, made by charging 75 parts of isoprene and 25 parts of styrene using dehydrogenated rosin soap. 60-70 viscosity.

"The isoprene-styrene polymer shows improved hysteresis characteristics in carcass type stocks and may have improved tack. Due to the presence of isoprene, this polymer is similar to natural rubber in chemical and aging characteristics."

COMPOUND No. 24

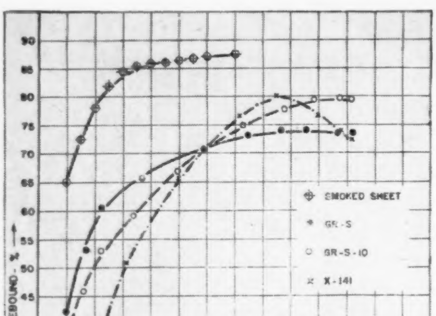
Polymer "X-141"	100.0
Sulfur	3.5
MBT	2.0
Coumarone-indene Resin	7.5
ELC Magnesia	5.0
Zinc Oxide	100.0

ORIGINAL RESULTS

Time of Cure Min. at 45 Lb.	Tensile Strength (psi)	Per Cent Elongation	Modulus Load (psi) for Elongation of: 200%	300%	400%	500%	Permanent Set	Shore Hardness	Tear Resistance Tested at: Room Temp.	100°C.
7.5	1580	890	145	220	295	405	.31	36	97	55
15	1400	695	225	300	415	605	.24	41	87	50
30	1340	600	260	410	600	935	.18	45	88	47
45	1340	580	335	450	675	1050	.18	46	85	43
60	1340	580	335	450	635	1010	.17	47	98	48
90	1610	630	335	450	635	975	.18	47	94	49

Time of Cure Min. at 45 Lb.	Goodyear-Healey Pendulum: Indentation in mm.	Per Cent Rebound	Shore Hardness	Compression Fatigue (Goodrich Flexometer)*: Per Cent Initial Comp.	Running Time and Per Cent Permanent Set	Max. Temp. Rise °C.	Dynamic Compression: Initial	Final	Cut-Growth Resistance Tested at 70° C. Inches Failure: 6,500 Cyc.
90	7.75	42.3	43	21.7	18'-6.2	31.2	7.6	13.7	.76

* Test Conditions: 93 lb. Load. 0.25" Stroke. 100° C. Oven Temp.



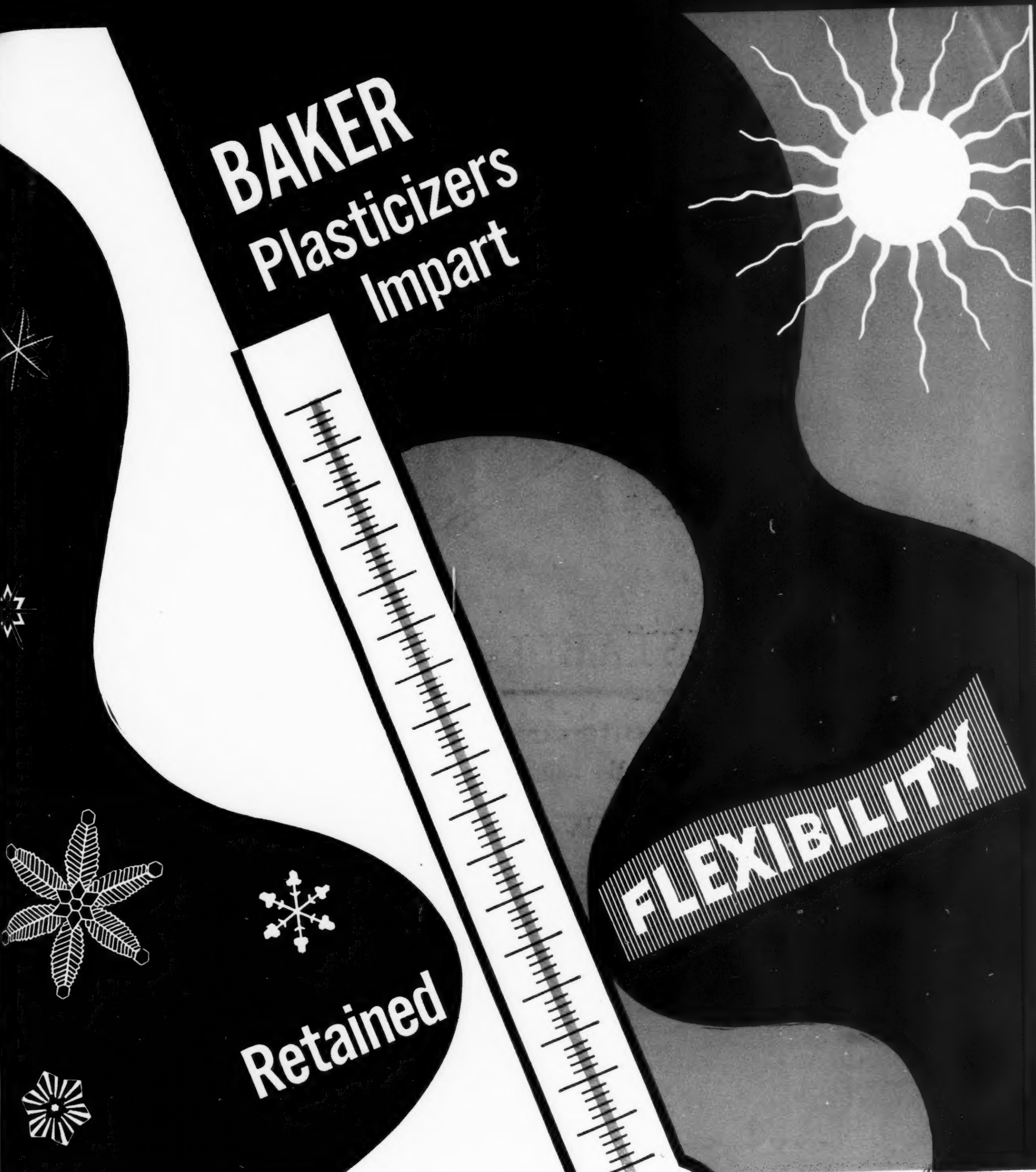
X-141 gives moderate tensiles, higher modulus and better tear resistance than GR-S or GR-S-10. In spite of comparatively low room-temperature pendulum rebound, the X-141 polymer gives lower heat generation than GR-S or GR-S-10.

The Rebound-Temperature curves for Natural Rubber, GR-S, GR-S-10 and X-141 are shown for a range of 0-200° C. The X-141 curve rises rapidly from a low of 7.8% at 0° C., and crosses the GR-S and GR-S-10 curves at approximately 100° C., finally reaching a peak of 80% at 148.5° C. The superior resilience properties of 100 parts of Zinc Oxide in natural rubber is shown on the chart for comparative purposes. The resilience properties of the synthetic rubbers remain the outstanding deficiency, although there are some indications of improvement in this direction.

THE NEW JERSEY ZINC COMPANY

160 FRONT STREET • NEW YORK 7, N. Y.

New Jersey Zinc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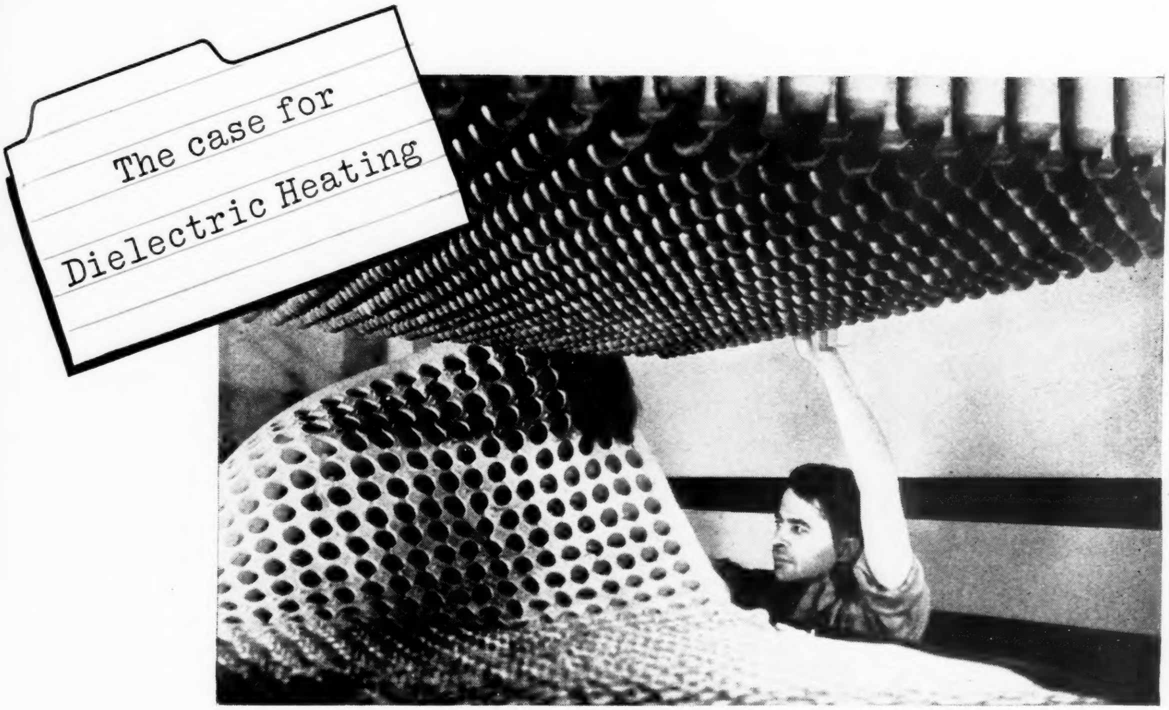
Plasticizers
Impart
FLEXIBILITY
Retained



putting new bounce into rubber production

*cut curing time by 92%**

Fast and profitable are the words for this newest application of electronics to rubber production. The old, steam-oven process of curing foamed sponge mattresses has yielded to modern electronics of the timesaving Westinghouse r.f. generator.

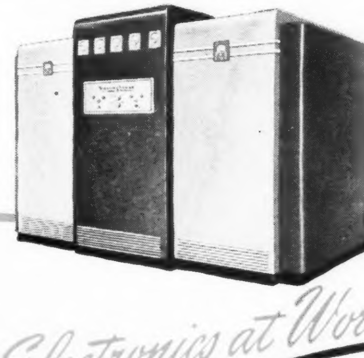
Sixty minutes formerly required for steam curing are now cut to five! And no expensive steel molds are needed to cure the full-size, double bed mattress . . . instead, an insulated mold is filled with the rubber latex mixture and delivered to the curing oven which contains the electrodes.

The 100 kw, 13.6 mc generator (see photo below), located in the superstructure above the curing oven, supplies the necessary power. After curing, the mattress is stripped from the mold in its final form (see photo above). Time reduction for curing: 92%!

The result is a better product, cured uniformly throughout the entire mass. Uniformity is obtained on each successive production cycle by automatic load matching networks, output load control and automatic frequency stabilization.

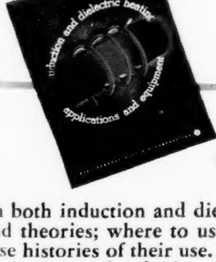
This strong case for dielectric heating in rubber is just one way it has demonstrated its versatility. Get the facts today from your nearest Westinghouse office. Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Pennsylvania. J-02073

*This is the first of a series of case histories on dielectric heating in rubber production.



Westinghouse

PLANTS IN 25 CITIES . . . OFFICES EVERYWHERE

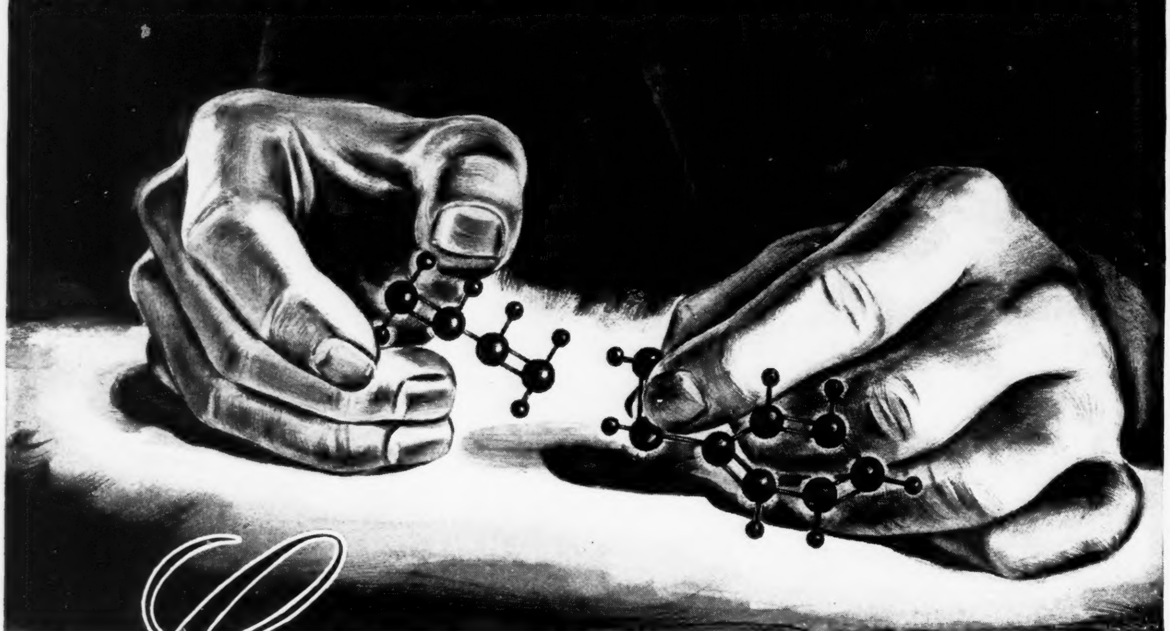


HERE'S FREE HELPFUL INFORMATION

on both induction and dielectric heating . . . their principles and theories; where to use them; how to select them; actual case histories of their use. Write for your copy today, on your business letterhead, please. Ask for B-3620.

Electronics at Work

SYNTHETIC RUBBER & RESIN COMPOUNDS



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A few Applications of GENERAL LATEX Product Development

- Aircraft Cements
- Carpet Backing
- Can Sealing
- Cable and Wire
- Combining Compounds
- General Adhesives
- Hose and Belting
- Impregnating Compounds
- Pile Fabrics
- Protective Clothing
- Shoe Adhesives
- Sizings

A practical approach to the use of synthetic dispersions in your product is to refer your problem to our laboratory. No matter what the process—coating, impregnating, or bonding—our experienced technical staff can compound the material best suited to your requirements. In the case of an entirely new product, we will work out all the details of manufacturing procedure—from pilot operations to commercial production in your plant. Why not talk it over with one of our technical representatives?

GRS latex types 2 and 3, normal and concentrated, available from stock.

A Complete Service to Manufacturers

RESEARCH • MATERIALS • ENGINEERING • MANUFACTURE

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Agents for Rubber Reserve Company for storage and distribution of natural rubber latex. Distributors for Rubber Reserve Company for synthetic latex. Operators of the Government-owned Baytown, Texas, synthetic rubber plant in collaboration with the General Tire & Rubber Co.


it's your move to Color...
THE RETURN of red tubes from war-time oblivion is setting the pattern for moves to color in many directions... In Drug Sundries, Mechanical Goods, and Footwear, COLOR will stimulate the change to stable peace-time markets . . . The return of white side-wall tires is a looming event for 1946 . . . In all of these production trends SILENE EF is a dominant factor because it is assuring greater success in color compounding . . . SILENE EF is essential in many non-black compounds of natural or synthetic rubber to give them the needed processing and good cured physical properties unobtainable when whitings or clays are used alone as the loading pigment.
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STANDARD Chemical Company
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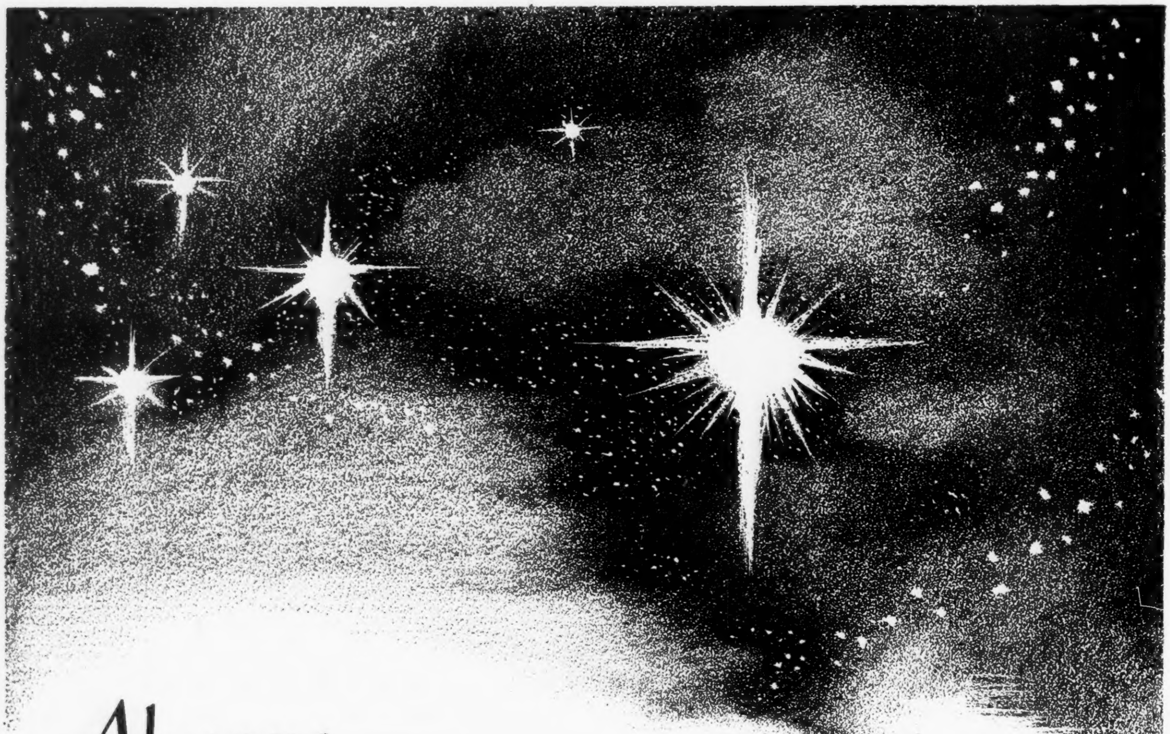
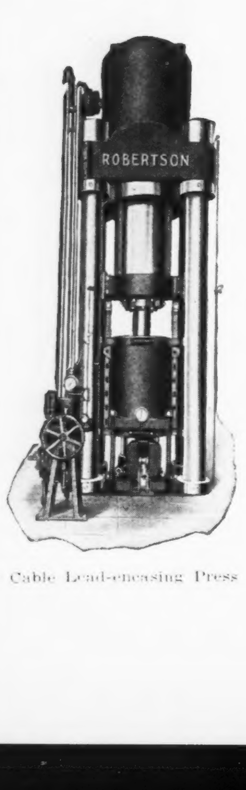


Always—One Star Shines Brighter—



Cable Lead-encasing Press

. . . like Polaris, guide-star for the navigator, whose beams reflect the responsibility entrusted by many. Just so, in every field, there is one company whose consistently higher standards of workmanship catch your attention. Their trust-worthy dependability *holds* it.

Robertson hydraulic equipment can rightly take its place among such leaders. For the John Robertson Company continually pioneers in engineering advancements to bring the finest in performance and craftsmanship. Robertson's service over a period of years to the leading manufacturers of lead-encased cable and rubber hose in the United States and Canada testifies to the faith and trust that belong to all Robertson Equipment.

JOHN Robertson
COMPANY INCORPORATED

131 WATER STREET, BROOKLYN 1, NEW YORK

Designers and Builders of all Types of Lead Encasing Machinery

Since 1858

HOW MUCH GR-S?

Whether faced with the high price of crude, the loss of crude supply, the shortage of carbon black, or the present shortage of GR-S, the wise compounder knows he has been protected when he has depended on compounds based on clean, stable, uniform standards of

RECLAIMED RUBBER

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It costs no more to buy the best. That's why leading manufacturers prefer Pequanoc Standards.

PEQUANOC RUBBER CO.

BUTLER, NEW JERSEY

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BURNETT & CO. (London) Ltd.
46 HERGA COURT
HARROW-ON-HILL, MIDDLESEX, ENGLAND

Reclaim

your synthetic scrap with

POLYMEL "6" and POLYMEL "AX"

by cold plasticization

Typical synthetic cured scrap compounds:

COMPOSITION

GR-S cured scrap	100.0
Butyl cured scrap	10.0
Neoprene scrap	10.0
Polymel plast. No. 6	35.0
Polymel plast. No. 7 liquid	5.0
Zinc oxide	2.0
Cumate	0.3
Sulfur	1.4
Cure 8 min. at	305° F.

PHYSICAL TESTS

Shore hardness	**72**
Tensile	**908 p.s.i.**
Elongation	**295%**
Per. set at break	**18%**
Material cost	**0.0237 cts. a lb.**

COMPOSITION

GR-S cured tire tread	100	100.0
Plasticizer Polymel No. 6	30	30.0
Curative master batch	13	....
Total	143	

MASTER BATCH

GR-S rubber	67.0	6.7
Philblack A	28.5	2.85
Zinc oxide	20.0	2.0
Sulfur	12.0	1.2
Cumate	2.5	0.25
Totals	130.0	143.0
Cure 8 min. at		307° F.

PHYSICAL TESTS

Shore hardness	**67**
Tensile	**1080 p.s.i.**
Elongation	**365%**
Per. set at break	**16%**
Material cost	**0.0462 cts. a lb.**

COMPOSITION

GR-S cured scrap	100.0
Polymel plast. No. AX	20.0
Zinc stearate	0.5
M.B.T.S.	0.8
Sulfur	1.0
Cure 8 min. at	307° F.

VULCANIZATION TESTS

Shore hardness	**70**
Tensile strength	**745 p.s.i.**
Elongation	**250%**

Cost of material 0.0221 cents a lb. based on crude scrap at 0.0125 cts. a lb.

For further data, please write

THE POLYMEL CORPORATION

LINCOLN BOULEVARD MIDDLESEX, NEW JERSEY


ADAMSON UNITED
Introduces Newly Designed
MILLS and CALENDERS
for RUBBER, SYNTHETICS and PLASTICS
Note These Outstanding Mill Features
FOR HIGH TEMPERATURE OPERATION:
• SPECIAL BEARING METALS or ANTI-FRICTION BEARINGS, provided with flood lubrication and temperature conditioning of oil. (Cooling before recirculating.)
• ROLLS accurately bored to assure uniform roll surface temperatures.
• STUFFING BOXES of improved type with syphon arrangement for introduction of high pressure steam to rolls.
FOR MAINTAINING CLEAN, UNCONTAMINATED STOCK:
• BEARING OIL SEALS that really keep oil in bearings and stock out of bearings.
• TILTABLE STOCK GUIDES to facilitate cleaning.
• STOCK GUIDES AND STOCK PANS made of chromium or stainless steel.
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ADDITIONAL ADVANTAGES:
• New and Unique Types of Power Transmission.
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• Motorized Roll Adjustment.
• Power or Manually Operated Roll Scrapers.
Many of the above improvements also apply to our Modern CALENDERS.
Adamson United Company engineers specialize in the design and construction of equipment for special or unusual processing requirements. Their experience and abilities are at the service of the industry.
Close Up of Tiltable Guide
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Adamson United 12" x 24" Mill
ADAMSON UNITED COMPANY AKRON, OHIO
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IT PAYS TO
KNOW *MORE*
ABOUT

HERCULES

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THE

PROBLEM?

. . . A LETTER TO HERCULES MAY GIVE YOU THE ANSWER, as it is doing for hundreds of others every month . . .

Are you seeking chemical materials that might better the quality or performance of your products, or improve their processing? If so, take a cue from the hundreds of other manufacturers who write to us every month for help in the selection and use of Hercules chemical materials.

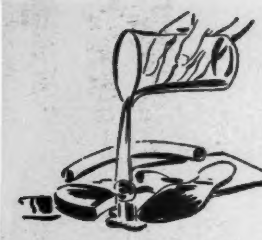
Hercules' broad experience in the development, production, and application of terpene and rosin chemicals, synthetics, cellulose products, chemical cotton, and other chemical materials for the rubber industry, can guide you toward the most effective and economical ways to employ these products.

Drop us a line today, outlining your problem or mentioning the Hercules chemical materials in which you are interested. Your inquiry will receive prompt attention, no matter how moderate your needs.

*Reg. U. S. Pat. Off. by Hercules Powder Company

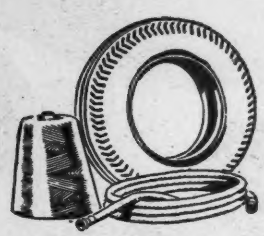
HEMICAL MATERIALS FOR HE RUBBER INDUSTRY

Hercules chemical materials for the rubber industry include:



Solvenol* . . .
A strong solvent for rubber, with a slow rate of evaporation. Widely used in rubber reclaiming.

Staybelite* Esters . . .
Low-cost tackifiers, compatible with all synthetic rubber Valuable in pressure-sensitiv adhesives.



Chemical Cotton . . .
Basis for the toughest high-tenacity rayon for automobile tires, hose, belting, and other rubber products.

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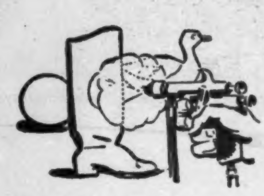
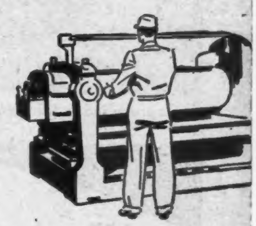
One of Hercules' many resi derivatives, Dresinate 731 i the emulsifying agent used t make GR-S-10.



Nitrocellulose . . .
Hercules nitrocellulose and ethyl cellulose provide lacquers of maximum adhesion, durability, gloss, and color.



Staybelite* Resins . . .
Odorless, non-staining soften ers for natural rubber.

FOR FURTHER DETAILS

HERCULES POWDER COMPANY
INCORPORATED
914 Market Street, Wilmington 99, Delaware

Please send information on______________________

____

Name______________________

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Company______________________

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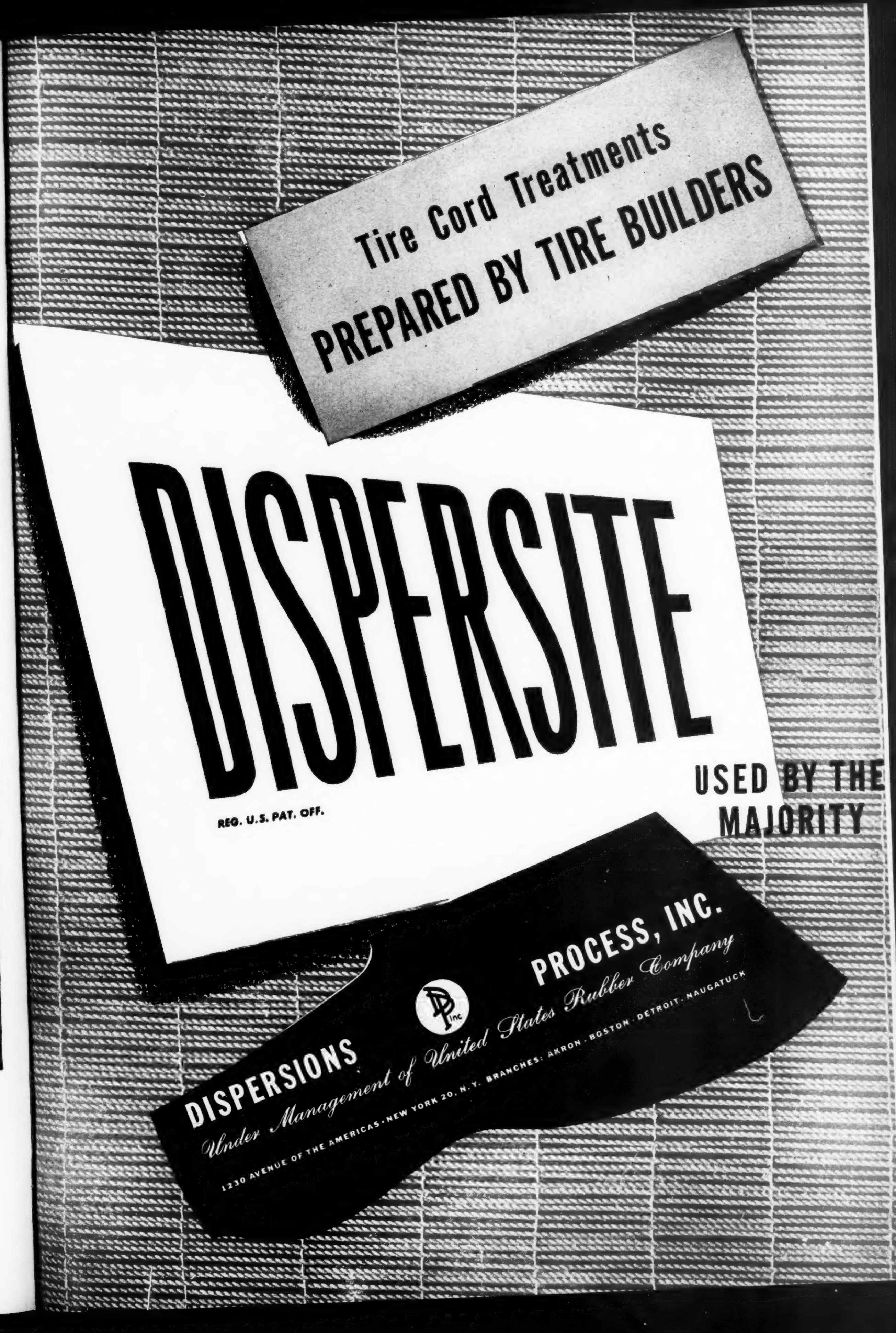
• Neoprene industrial truck casters and wheels. Photo courtesy L. H. Gilmer Co., Phila., Pa.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Under Management of United States Rubber Company
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August, 1946

Volume 114 Number 5

A Bill Brothers Publication

INDIA
RUBBER WORLD
NATURAL & SYNTHETIC

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INDIA
RUBBER WORLD
NATURAL & SYNTHETIC

Volume 114 New York, August, 1946 Number 5

Statistical Control in the Physical Testing of Rubber[1]

J. D. Heide[2]

IT IS a commonly accepted fact that complete reproductibility cannot be obtained in the manufacture of commercial products. It is equally true, but not so commonly accepted, that repeated tests on samples drawn from a completely homogeneous master sample will not yield completely similar results.

This fact is not apparent in many of the usual measurements. For example, suppose that one were to measure repeatedly the diameter of a cylindrical shaft with a micrometer. The results obtained, if the measurement were made to the nearest 0.001-inch, would appear identical, and thus it would seem that completely reproducible results were obtained.

The other extreme is, perhaps, the measure of tensile strength of rubber. Assume for the moment that we have a completely homogeneous batch of some standard rubber compound which has been cured in such a way that the temperature and the pressure exerted were everywhere exactly the same. Next, assume that we cut out a large number of dumbbell pieces from this sheet of cured rubber with a single die and test each piece for tensile strength. Anyone with experience in rubber processing would, I am sure, agree that the tensile results from such test pieces would not be identical.

The difference between the measurement of a cylindrical shaft and a rubber sample is, however, only one of degree, for if we had attempted to measure with an ordinary micrometer the diameter of the shaft to the nearest 0.00001-inch instead of to the nearest 0.001-inch, completely identical result would not have been obtained. In fact, W. A. Shewhart, who is considered the founder of the industrial application of statistics, points out that a shaft does not have a diameter, but has, for any given length, an infinite number of diameters. Thus regardless of type of measurement, variation exists in results obtained.

In many products variation in observed results due to testing methods is of negligible importance. In the physical testing of rubber, variations in test results is extremely important. The proper evaluation of rubber compounds through physical testing requires that variation in test results due to testing be adequately determined and properly controlled.

Application of Statistical Analysis to Industry

A relatively recent application of the science of statistics to industry is found in the determination and the control of observed variability in test results. It is my purpose to discuss in general terms the methods by which this is done.

Two types of test samples need to be considered. In one instance a sample can be measured repeatedly without destruction or distortion of the measured sample. The measurement of the diameter of a shaft is an example. In other instances measurement either destroys or distorts the sample in such a way that only a single measurement can be made. An example of the latter is the tensile or modulus measurement on a dumbbell cut from a rubber sample. In the first instance we can consider the variation observed in the repetitive measurements of the sample; in the second instance we may possibly, through a certain degree of idealization, discuss the variation encountered in successive measurement of samples drawn from a completely homogeneous master sample.

In either instance a certain pattern of variation will be observed. In Figure 1 are exhibited two of these patterns of variation: (a) the pattern of variation of 200 successive measurements of the diameter of a small round carbon rod, (b) 45 measurements of plasticity taken on 45 successively tested samples drawn from a master sample of GR-S. The patterns of variation exhibited in Figure 1 are the basis for the statistical work used in controlling physical testing of rubber. In most, if not all, instances this pattern can be adequately described by a normal distribution. This is true whether there is repetitive testing on a single sample or testing on successive samples drawn from a master sample. Typical normal distributions are shown in Figure 2 superimposed upon the observed patterns of variation already displayed in Figure 1.

Any normal distribution is completely determined by two parameters.[3] These are the mean, a common symbol for which is $\bar{x}$, and the standard deviation, the

[1] Presented before the Rubber Division, Canadian Institute of Chemists, Toronto, Ont., June 25, 1946.
[2] United States Rubber Co., General Laboratories, Passaic, N. J.
[3] "A.S.T.M. Manual on Presentation of Data," p. 13, American Society for Testing Materials, Philadelphia, Pa. 1943.

A. Histogram of 200 Measurements on a Carbon Rod

B. Histogram of 45 Mooney Values on X-55 Bale

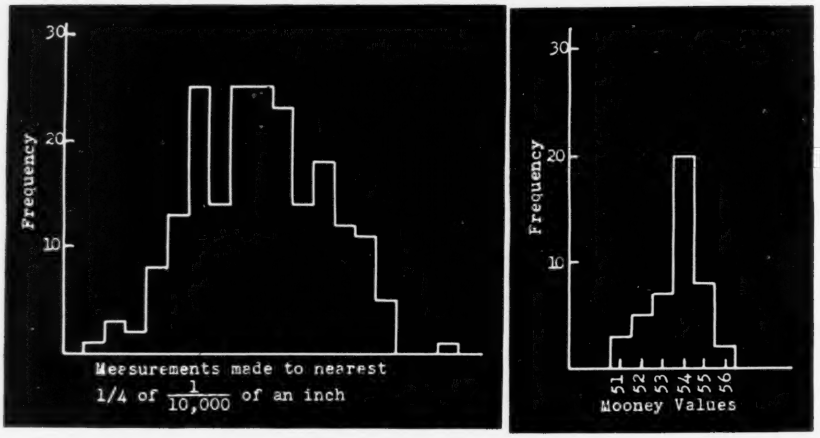


Fig. 1. Pattern of Variation for 200 Measurements on Carbon Rod and on 45 Mooney Valves on a Bale of GR-S

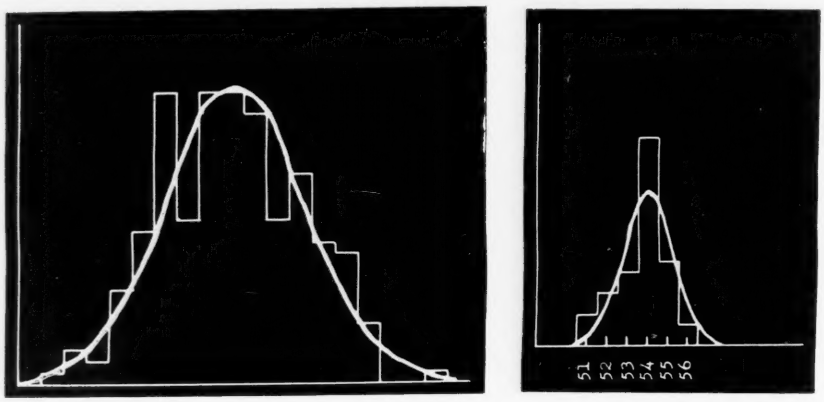


Fig. 2. Normal Distribution Curve Superimposed on Patterns of Variation of Figure 1

common symbol for which is the Greek letter σ. The Mean, $\bar{X}$, is the measure of central tendency of distribution and can be said to "position" the distribution. The standard deviation, σ, is the measure of spread of the distribution. For any normal distribution complete information is derived from the two parameters, $\bar{X}$ and σ. An extremely important item of information is the percentage of frequencies expected between $\bar{X} \pm \sigma$. Because this is known for a normal distribution and because the normal distribution so frequently describes the patterns of variation observed in repetitive testing, the standard deviation of such a pattern has been accepted as a measure of this variation. The term "testing error" has become very popular in describing this variation. Testing error, as we use it, is defined as the standard deviation of the distribution of either repeated tests made upon a single sample or successive tests made on successive samples drawn from a completely homogeneous master sample.

Examples of Use of "Testing Error"

Before discussing some of the difficulties encountered in arriving at an adequate estimate of the testing error for any particular test of physical rubber, it will be advantageous to discuss some of the uses of this measure of testing variability. In the simplest case (statistically speaking) involved in the physical testing of rubber, that is, in the running of a Mooney test, we find an example. Suppose the control laboratory is asked to test samples A and B for some factory or for some experimenter. The Mooney result on sample A is 50 and the result on B is 53. Is sample A softer than sample B? This question can not be properly answered unless the reliability of the Mooney test, as carried out in the laboratory producing these results, is known. Suppose the testing error in this particular laboratory is known to be 1.6. Then there is no assurance that a difference exists between sample A and sample B. However, if the testing error of the laboratory under consideration is known to be .8 Mooney, a difference as large as 3 Mooneys would be observed so infrequently that complete assurance is had that sample A is really softer than sample B. This point illustrates one of the uses of testing error in the interpretation of test results.

Another use is in the determination of how far the observed sample result may be from the true value of the sample. For instance, a 300% modulus result of 1250 psi. is observed. This is not taken as the true or ideal value of the material from which the sample is drawn because it is well known that variations due to compounding, curing, and tensiling have an effect on the test results. But the man who submitted the sample is extremely interested in determining within what distance of the observed value the true value falls. A very good estimation of this range can be made if the test is running "under control" with a known testing error. If the testing error on 300% modulus is 40 psi. chances are 19 out of 20 that the true value is within 80 psi. of the observed value.

Determination of Testing Error

In the Mooney plasticity test the estimation of a

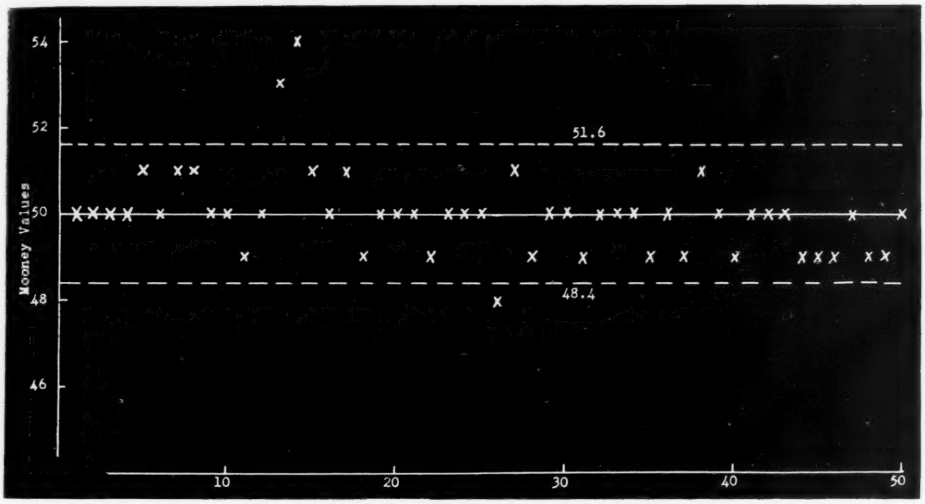


Fig. 3. Control Chart of Mooney Values on GR-S Standard

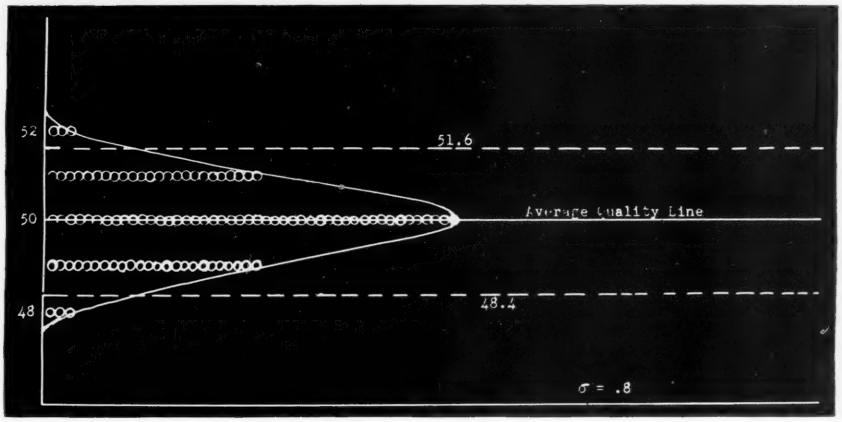


Fig. 4. Estimated Pattern of Variation of Mooney Values

pattern of variation, and consequently the testing error, is relatively simple. The test is made in a single step. A large mass of thoroughly mixed homogeneous material can be the source of numerous samples. These samples can be run consecutively. A frequency distribution of these samples is an estimate of the pattern variation expected from this test. Such a frequency distribution was shown in Figures 1 and 2.

However this method of estimating the pattern of variation even for a simple (from a statistical viewpoint) test like the Mooney test has certain deficiencies. It does not take into consideration variations from day to day caused by any number of factors affecting the test which, although relatively constant during a short period, have a significant effect on Mooney results over a longer period. Therefore a better estimate of a pattern of variation would take into account the time element. Rather than run a large number of successive tests at one time, the homogeneous samples could be run two or three a day for several days. In Figure 3 we have displayed the results of samples thus run. Points #13 and #14 reflect an obvious shift in level of Mooney values.

Means are at hand, however, to eliminate the effects of these shifts in level from our estimate of the pattern of variation. In Figure 4 is displayed a pattern of variation for the Mooney machine which has been found to be accurate. Accepting for a moment the distribution displayed in Figure 4 as being a fair estimate of the pattern of variation for this test, we propose to show how such a test is controlled by statistical means. The two horizontal lines drawn at the values 48.4 and 51.6 encompass practically all (i.e. 95%) of the results obtained from the successive tests on the standard sample. These two values are then set up as limits upon the variability of this standard sample. A control chart is constructed with these limits. This has already been displayed in Figure 3.

Once the chart is set up, the standard material is tested periodically. This test may be once per shift, twice per shift, or at some other interval. Each time a test is made on the standard, the value is posted on the chart. As long as the points fall between the lower limit of 48.4 and the upper limit of 51.6 in an acceptable pattern, the operation of the Mooney machine for material similar to the standard is deemed acceptable. The limits on the chart, set at two testing errors from the average quality level, are measures of the limit of variation expected. It can be seen that the first 12 points on the chart were all between the limit lines in an acceptable pattern. Point 13, however, has a value of 53. As a check, another sample was immediately run and found to have a value of 54 (see point 14). These two values both above the upper limit are construed as evidence that the operation of this machine was not as it had been during the preceding period.

Before any other tests were run, the equipment and methods of operation were examined. In this instance it was found that a new operator had been assigned to this job without adequate instruction. Because he

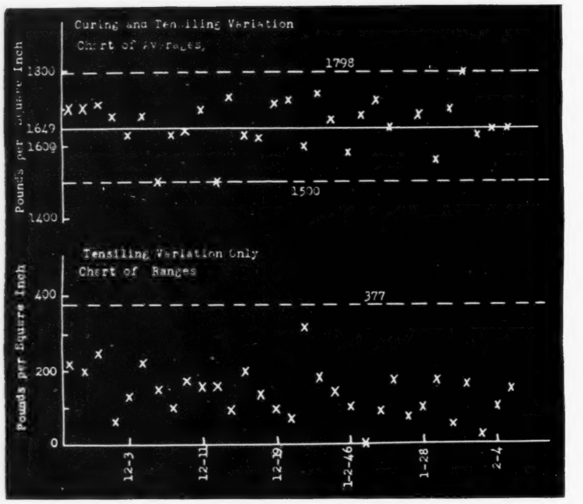


Fig. 5. 300% Modulus Control Chart (Curing and Testing)

had failed to allow the sample either sufficient conditioning time, or running time, the test results were high. When this condition was corrected, the standard again fell between the limit lines in an acceptable pattern until point 26 was observed below the lower limit. A recheck here revealed the next point to be within the limits. It was here assumed that point 26 was one of the 5% expected to fall outside the limits through chance.

Methods for Preparing Control Charts

Although it is not the purpose of this paper to delineate the routine methods of constructing control charts the problem of obtaining testing error on tensile results is of sufficient interest to warrant some exposition of the methods. A typical procedure in testing rubber for modulus, tensile, and elongation is to compound and cure a flat six-inch by six-inch by 100-gage sample, cut and test three dumbbell pieces from the sample. The observed results involve variations due to compounding (in many instances), variations due to curing, and variations in tensiling. The term tensiling is used here to refer only to the operation of the Scott or other tensile machine. In some instances interest lies only in the cumultive variation caused by the three phases of the test. In other instances we are greatly interested in the variations due to each of the three phases.

Let us for the moment examine that variation due to tensiling alone. For all practical purposes the 100-gage sample is homogeneous within itself but with regard to compounding and curing. Therefore any variation between the three results on a single sample is largely due to variations of the tensiling operation itself.

This variation can be measured by the range of the sample, which is defined as the difference between the maximum and the minimum values in the sample. A definite relation exists between the average range of samples of a given size and the testing error. If the sample size is three, as is usually the case, the testing error, that is, the standard deviation or the pattern of variation or frequency distribution, is found by multiplying the average range by 0.59. This is the testing error of individual tensile readings. To determine the testing error of the averages of three readings the average range must be multiplied by 0.341.

A very common mistake in the use of control chart procedures is the use of this particular average range for the tensiling operation as the basis for determining the testing error for the combined operations of compounding, curing, and tensiling. It should be emphasized that the variation thus found was only due to variations in the tensiling operation itself.

The lower half of Figure 5 is a chart of the ranges thus found. If it is desired to determine the variation due to curing and tensiling combined, the following procedure must be followed.

A master sample of some compound in which interest lies must be thoroughly mixed. Successive samples are drawn therefrom, and each sample is cured individually. This sample is then died out into dumbbell pieces, probably three from each sample. The dumbbell pieces are then tested. The average result of the three pieces is then taken as the measure of the sample. Precautions must be taken against deterioration of the compounded standard. The selection of this standard will be based largely on its stability.

A little reflection makes it clear that this average result is the best estimate of an individual sample and is therefore to be considered as an individual reading. The variation between these averages is then the basis for estimating the pattern of variation and the testing error where curing and tensiling are to be considered together as the test.

The upper half of Figure 5 shows the values obtained for 300% modulus by this procedure. Limit lines are shown, both in the upper and in the lower half of Figure 5. The nature of these limit lines is of considerable interest. Notice that the so-called chart of averages in the upper half has both lower and upper limit lines. So long as the points obtained on periodical tests of the rubber standard fall within these limits in an acceptable pattern, the equipment used for experimental or process tests of analogous compounds is considered to be functioning adequately. Furthermore the distance of the limit lines from the average line is set in such a way that one half this distance is the testing error of the test. There is therefore at hand a measure of the reliability of results on process or experimental tests of a nature similar to the standard and made during the current period.

The limit lines on control charts are most frequently set by multiplication of an average range by some suitably selected factor. The average range is not, in this instance, the average range of the chart in the lower half of Figure 5, although the mistake of using this average range is almost uniformly made. As previously mentioned, the range plotted in the lower half of Figure 5 is a measure of the variability within three dumbbells taken from the same sample. It does not therefore reflect in any way variations between samples.

This range for tests on the same sample has a different and distinct use. A frequently disturbing feature of tensile results is the observance of a large range. Every laboratory probably has a rule subjectively or arbitrarily arrived at for determining whether or not test results should be discarded. The chart displayed furnishes an objective means for doing this. Ranges of test results, as well as the individual tests results, fall into a determinable pattern. The upper limit line can be established from this pattern. The upper limit on ranges is shown by the line on the chart of ranges displayed in Figure 5. As long as ranges fall below this line in an acceptable pattern, all the test results should be accepted. However the observance of a range outside or above this line is taken as evidence that some-

(*Continued on page* 665)

New Developments in Silastic[1]— The Heat Resistant Silicone Rubber

P. C. Servais[2]

ABOUT six months ago a series of new and considerably improved Silastic stocks were made available.[3] Many uses have been found for these stocks because of their exceptional heat-stability, resistance to oxidation, and good electrical insulating properties. Very recently two more Silastic formulations were developed. One, known as Silastic 181, is a crepe designed especially for use in fabricating gaskets. The other, Silastic 121, is a Silastic calking compound.

Silastic stocks were about 90% inorganic materials built upon an exceptionally stable skeleton of silicon-oxygen atoms. The strength of the bond between these silicon and oxygen atoms measured in terms of kilocalories per mol is 89.3. The bonding energy between the carbon atoms which form the skeleton on which organic rubbers, both natural and synthetic, are built is only 58.5 kilocalories per mol. This very considerable difference in the bond strength between the atoms which form the basic molecular structure of Silastic and between those which form the molecular skeleton of organic rubbers has a very direct bearing on the greater thermal stability and oxidation resistance characteristic of Silastic.

The ability of Silastic to withstand temperatures both above and below those which cause organic types of rubber to harden or decompose has been documented in previous articles.[4]

More significant perhaps than laboratory evidences of heat stability are the actual performance records of Silastic in various industrial applications. During the war a Silastic paste was used for insulating fixed wire-wound resistors.[5] To qualify as insulation for Grade I Class I resistors, these Silastic coatings were required to endure operation at about 525° F. and to withstand the thermal shock of being plunged from operating temperatures into ice-cold water nine successive times. Silastic coated resistors passed those arduous specifications. There was, in fact, no noticeable change in these Silastic coatings until temperatures of more than 600° F. were encountered, when a slight checking occurred.

More recently Silastic gaskets have been approved for sealing the rocker boxes of the 3650 h.p. Pratt & Whitney Wasp Major aircraft engine. In this application the gaskets are in constant contact with hot oil and withstand operating temperature of 450° F. (See Figure 1.)

Tests and performance reports indicate that Silastic products will withstand continuous exposure to temperatures of at least 300° F. and that they will endure for considerable periods of time temperatures of more than 500° F. It was logical, therefore, to develop as rapidly as possible a special Silastic stock for use in fabricating heat-resistant gaskets.

Silastic 181

The main function of a gasket is to confine the liquids and gases handled in many different kinds of process industries and in many different kinds of equipment and machinery. The constant demand for better gaskets has resulted in very efficient gasketing materials for use at moderate temperatures. However at temperatures above 200° F. there is still a definite need of better materials. In many high-temperature applications gaskets of metal or other non-resilient materials are used even though resiliency is one of the primary requirements in a good gasketing material.

Pratt & Whitney Aircraft

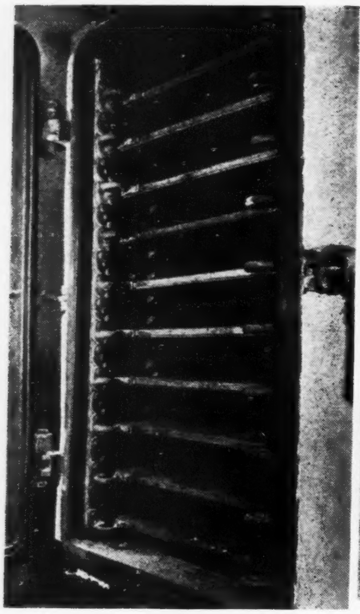
Fig. 1. Silastic Gaskets Reinforced with Glass Fabric Being Installed on the Rocker Boxes of the 3650 H.P., 28-Cylinder Pratt & Whitney Wasp Major

The two most important properties in an ideal gasket are: (1) low compression set at operating temperatures; (2) resistance to attack by the confined material. Both of these are important to the satisfactory performance of the sealing material.

The more important of these two properties is the ability to be compressed for long periods of time without taking a permanent set. This is the property of a resilient material and the failure of a gasket at elevated temperatures is generally due to loss of resiliency. If the gasketing material hardens, or if it softens and becomes plastic, or if an additional cure at a high operating temperature sets the gasket into a new and thinner form, the gasket fails. Anything that causes the gasket to lose its resiliency makes the joint it is sealing subject to leakage caused by such factors as vibration, expansion and contraction with temperature changes, and the movement of parts caused by pressure variations.

The resistance of a material to permanent change of shape is shown by a low compression set value. To prevent leakage in a system it is necessary to be sure that the compression set of the gasket material is low at the temperature of operation. Many materials that show satisfactory values at 158° F. are subject to an excessively high percentage of compression set at temperatures of 200 to 300° F. Such temperatures are not uncommon, and they are considerably below the

[1] Trade mark, Dow Corning Corp.
[2] Dow Corning Corp., Midland, Mich.
[3] "Silastic Facts No. 1A," Dow Corning Corp., 1946.
[4] C. M. Doede, G. D. Norsica, and A. Panagrossi, "Some Properties of Silastic at Elevated Temperatures," presented before Division of Rubber Chemistry, A. C. S., Atlantic City, N. J., Apr. 10, 1946.
[5] E. E. Marbaker, *J. Am. Ceramic Soc.*, 28, 329 (1945).



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2A

Fig. 2. Gaskets of Silastic 181 Are Used to Seal Steam-Heated Vacuum Oven. Both High Temperatures and a Considerable Pressure Differential Complicate This Application in Which any Leakage of Steam Would Spoil the Vacuum

Fig. 2A. Enlarged View of Silastic Gaskets on Two of the Connections of the Vacuum Oven

operating temperatures to which gaskets are frequently subjected.

TABLE 1. CHEMICAL RESISTANCE OF SILASTIC

Chemical Used	Concentration	Coating and Laminating 120	121	125	Molding and Extruding 150	160	167	180	181
Water		G	G	G	G	G	G	G	G
Hydrogen peroxide	3%	G	G	G	G	G	G	G	G
Ammonium hydroxide	10%	G	G	G	G	G	G	G	G
	Conc.	F	G	F	G	G	G	G	G
Sodium hydroxide	10%	P	F	P	F	P	P	G	G
	50%	G	G	G	G	G	G	G	G
Sodium carbonate	2%	G	G	G	G	G	G	G	G
Sodium chloride	10%	G	G	G	G	G	G	G	G
Sulfuric acid	10%	P	G	P	P	P	P	G	G
	30%	P	G	P	P	P	P	G	G
	Conc.	P	P	P	P	P	P	G	P
Nitric acid	10%	F	G	F	G	G	P	G	G
	Conc.	P	P	P	P	P	P	F	G
Hydrochloric acid	10%	F	G	F	G	F	P	G	G
	Conc.	P	P	P	P	P	P	F	G
Acetic acid	5%	G	G	G	P	F	G	G	G
	Conc.	G	G	G	P	P	G	G	G
Toluene		P	P	P	P	P	P	P	P
Acetone		G	G	G	G	F	F	G	G
Gasoline		P	F	P	P	P	P	P	P
Stoddard solvent		P	P	P	P	P	P	P	P
Mineral oil		G	G	G	G	G	G	G	G
Carbon tetrachloride		P	P	P	P	P	P	P	P
Sodium hypochlorite	3%	..	..	..	..	..	..	..	G
	15%	..	..	..	..	..	..	..	G
Formic acid	5%	..	..	..	..	..	..	..	G
	87%	..	..	..	..	..	..	..	G
Tricresyl phosphate		..	G	..	..	..	..	..	G

Note: In determining the ratings given above, the following standards were observed. Resistance is called "Good" if the test samples show a change of not more than 10% in weight or volume and if they retain at least two-thirds of their original Shore Efficiency. Resistance is called "Fair" if the test samples show a change of not more than 20% in weight or volume and if they retain at least one-third of their original Shore Efficiency. Resistance is called "Poor" if the above standards are not met. In every case due consideration was also given to the appearance of test samples.

In the course of evaluating Silastic 181, most of the conventional gasket materials have been tested for compression set following the procedure outlined in ASTM D 395-40T, Method B, except that the specified testing temperature of 158° F. was increased to 200, 300, and

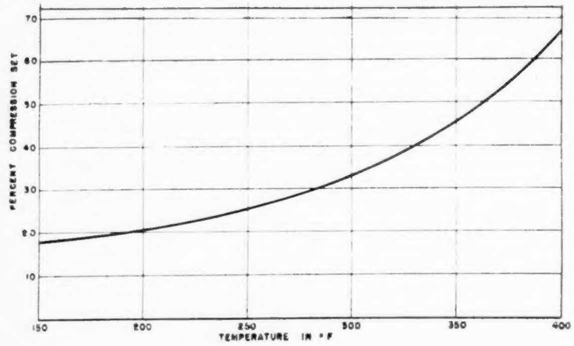

Fig. 3. Increase in % of Compression Set of Silastic 181 Measured According to A.S.T.M. D 395-40T, Method B, at Temperatures Ranging from 150 to 400° F.

400° F. Included were samples of natural rubber, GR-S, neoprene-cork, neoprene-asbestos, vinyl polymer, and Silastic 181. All of these materials with the exception of Silastic 181 and neoprene-cork had a compression set value of more than 50% after being compressed to 75% of their original thickness for six hours at 200° F. At temperatures above 200° F., Silastic 181 shows considerably better resistance for extended periods of time to permanent compression set than any other gasketing material tested. A typical use for gaskets of Silastic 181 is illustrated in Figure 2 and 2A.

The increase in composition set (ASTM D 395-40T, Method B) with the increasing temperatures at which Silastic 181 was tested is shown in Figure 3.

The second important property desirable in a gasketing material is resistance to attack by various chemicals. The chemical resistance of molded Silastic samples has been tested according to ASTM D-543-43 and is reported in Table 1. The reagents used were selected as being typical of various classes of solvents and chemicals.

Silastic 181, which was developed primarily as a gasketing material, shows very good resistance to almost all of the chemicals used. It is not affected by strong acids, bases, or salt solutions, and it does not swell on immersion in acetone, mineral oil, or tricresyl phosphate. It is unsatisfactory only in the presence of concentrated sulfuric acid and such solvents as carbon tetrachloride, toluene, gasoline, and Stoddard solvent. In the case of these solvents, however, the swelling is not permanent. On evaporation of the solvent the sample regains its original size, weight, and Shore Efficiency.[6]

Silastic Calking Compound

Silastic 121 is the most recently developed Silastic paste and is designed especially for use as a calking compound. It is produced in a putty-like consistency for convenient use in sealing cracks and seams in metal assemblies or for sealing voids in ceramics, glass, or other structural materials where a resilent and heat stable filler is required.

Silastic 121 cures rapidly, requiring only 10 minutes at 250° F. It may be flame cured if the material itself is not too long exposed to the direct flame. This brief curing time at 250° F. vulcanizes Silastic 121, giving it rubber-like properties and causing it to expand slightly to form a tight and resilient seal. It is suitable for use in sealing hot gas ducts, pressurized aircraft cabins, metal boats, furnaces, ovens, and in the many other

[6] Shore Efficiency = $\frac{\text{Shore Hardness} \times \text{Elasticity of Sample After Immersion}}{\text{Shore Hardness} \times \text{Elasticity of Sample Before Immersion}} \times 100$
(See Bulletin R-5, Shore Instrument & Mfg. Co., Inc., Jamaica, N. Y.)

TABLE 2. PHYSICAL PROPERTIES OF SILASTIC
(Cured for 48 Hours at 390° F.)

Type of Silastic	Paste			Crepe				
Silastic Stock Number	120	121	125	150	160	167	180	181
Density (at 25° C.)	1.7	2.3	1.7	1.5	2.1	2.0	1.6	1.3
Hardness (Shore A scale)	50-60	85	40-50	45-55	55-65	55-65	75-85	60-70
Tensile strength (psi.)	500	600	400	400	600	600	700	475
Elongation (%)	150	50	200	300	200	110	75	90
% impact resilience*	45	..	52	53	52	54	47	..
Flex (DeMattia, Method B)								
% of elongation	50	..	50	70	50	20	20	..
No. of cycles	500,000	..	500,000	250,000	150,000	80,000	7,000	..
% Water absorption†	1.4	1.0	2.8	2.6	0.9	1.3	0.5	1.1
Water absorption (mgs./sq. in)†	20	21	39	47	17	25	7	15

*Bashore resiliometer. †After 7 days' immersion at room temperature.

TABLE 3. ELECTRICAL PROPERTIES OF SILASTIC
(Cured for 48 Hours at 390° F.)

Type of Silastic	Paste			Crepe				
Silastic Stock Number	120	121	125	150	160	167	180	181
Dielectric constant (10^6 cycles)	7.5	..	7.5	5.6	9.0	9.8	4.6	3.0
% power factor (10^3 cycles)	0.6	0.9	0.6	1.3	0.8	0.4	0.6	..
(10^6 cycles)	0.1	..	0.1	1.0	2.0	0.1	0.3	0.3
Dielectric strength (volts per mil)	1100	..	1100	500	500	500	650	..

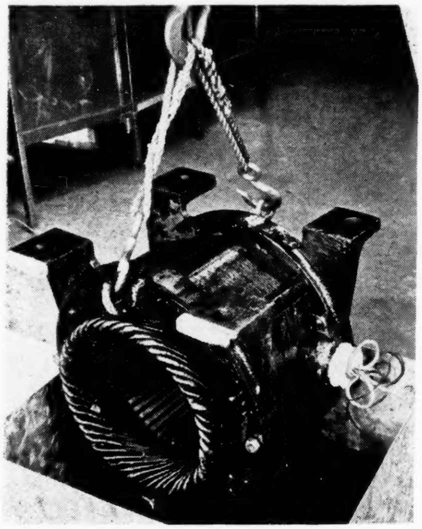

Fig. 4. Silastic 121 Is Used as a Calking Compound to Protect Leads from Abrasion and Seal Out Moisture and Dirt on Silicone Insulated Test Motors Which Operate at Temperatures up to 310° C.

places where gases or liquids must be confined at high or low temperatures and where resiliency in the calking compound is a desirable property. The chemical, electrical, and physical properties of Silastic 121 are given in Tables 1, 2 and 3.

The other two Silastic formulations for coating and laminating: namely Silastic 120 and 125, have found many industrial applications since they were first introduced. They have been very successfully used for embedding transformers and heating elements and for producing heat resistant, flexible, woven glass insulating tapes, diaphragms, thin gaskets, and conveyer belts.

All of these Silastic pastes are unique among flexible sealing materials in their resistance to both high and low temperatures. The paste can be cured in place to form permanent gaskets and seals, although Silastic 121 cures more readily than the other two pastes. An application for Silastic paste in the motor test laboratory at Dow Corning is shown in Figure 4. They can all be used to protect gaskets of such material as asbestos from oil and moisture.

The Silastic pastes have been successfully used as a compound for sealing pipe threads. The paste is simply applied to the threads and cured to form a rubbery seal by heating with a flame or by the heat transmitted to the pipe by the material conveyed through it. So cured, the Silastic material forms a seal which does not crack or melt, which remains resilent over a wide temperature range, and which prevents the freezing of the pipe connection.

Methods for Fabricating Silastic

The usual rubber fabricating techniques, with slight modifications, can be used in handling Silastic. The Silastic crepes can be press molded, extruded into shapes and over wire, or laminated with glass, asbestos, or wire fabric. The Silastic pastes can be molded, coated by conventional methods, or used as a bond to laminate glass fabrics. All of these operations can be done using regular equipment. Fabrication is followed in most cases of a two-stage cure. The Silastic fabrication is first semi-cured through the action of the vulcanizing agent at any temperature over 250° F. Silastic is then air cured at elevated temperatures to develop its optimum properties.

Conclusions

The new field of silicone chemistry is a rapidly developing one which has resulted in the production of exceptionally heat stable, semi-inorganic materials in liquid, resinous, and elastomeric form. Silicone elastomers produced in commercial quantities by Dow Corning under the trade name, Silastic, are most remarkable for their ability to retain rubber-like properties over a temperature range far beyond the limits of natural or synthetic organic rubbers.

New Silastic formulations are constantly being developed for special applications. Notable among these new Silastic stocks are Silastic 181 developed primarily for use as a high-temperature gasketing material and Silastic 121 for use as a calking compound.

At its present stage of development, Silastic is not intended as a replacement for natural or synthetic organic rubbers at the relatively low temperatures at which these more conventional materials are serviceable. Even at these lower temperatures, however, Silastic is frequently useful in applications requiring maximum resistance to oxidative hardening and weathering, or as electrical insulation where increased service life and added safety, maximum resistance to ozone, or high surface resistivity are desirable.

(*Continued on page 662*)

Marmix Reinforcer for Synthetic Rubber Latices

Howard H. Irvin [1]

ONE of the greatest assets of natural rubber latex has been its superior tensile strength in both cured and uncured compounds. As natural rubber latex disappeared from the market practically over night and GR-S latices were called upon to fill the gap, it became increasingly evident that the GR-S latices that were available were not able to fill this need.

GR-S type I and II latices were the first to be made available commercially. Type I latex supplied the regular standard grade of GR-S; Type II was the same latex but the antioxidant had been omitted. Both types were very poor in their physical properties; so Type III latex was put on the market. It was made with a 50/50 butadiene to styrene ratio in contrast to the 75/25 ratio of the Type I and II latices. Type III latex had much higher tensile strength and soon replaced Type I and II for almost every application. Type III latex, with some modifications, is still the most widely used type today.[2]

For certain applications where oil resistance was of prime importance Buna N-type latices entered the picture, but, as gum compounds, were inferior to neoprene latex in tensile strength.

To render these synthetic latices more useful, reinforcing agents had to be found which would help to make up all, or at least some, of the deficiencies in physical properties of synthetic latex products.

While carbon black proved to be the outstanding reinforcing agent for dry GR-S, its benefit in reinforcing Type I and II latices was found to be limited, and it was of little help when used with GR-S Type III. Clay proved of some value with Type III latex, and Silene and carbon black with Buna N-type latices.[3]

Organic Reinforces for Latices

In the meantime organic fillers had been used for reinforcing dry synthetic rubbers of the GR-S and Buna N type where it was important to get compounds with outstanding electrical properties, or where inorganic fillers were undesirable for other reasons.

Marbon S and S-1 resins found wide application as organic reinforcing agents for both GR-S and Buna N-type synthetics. It was believed at the time that Marbon S resin, dispersed in water, would make an equally good reinforcing agent for GR-S and Buna N latices. Marbon S was dispersed in water, and when this stable dispersion of the resin was added to synthetic latex compounds, it proved to be a far better reinforcing agent than any of the inorganic fillers. Such water dispersions of Marbon S resin are now marketed as Marmix.

The advantage of using Marmix lies not only in the better physical properties of the end product, but also in the convenient way of incorporating it in synthetic latices generally. While inorganic fillers are always difficult to disperse, settle out if improperly ground, and tend to decrease the stability of latex compounds, Marmix will not present any of these problems. Since Marmix is a water dispersion of a resin, it is so similar in physical constitution to synthetic rubber latices that the two can be blended easily, and these blends will maintain their stability for an indefinite period.

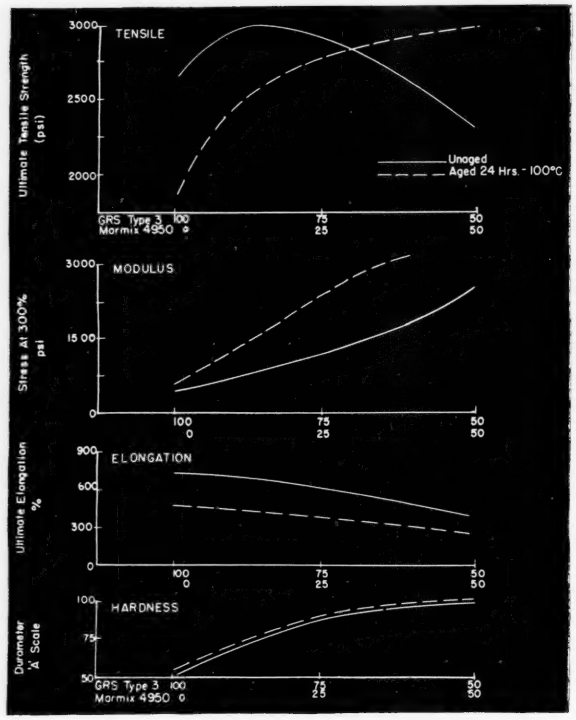

Fig. 1. GR-S Type III Latex Compounds Reinforced with Marmix

Improvement of tensile strength of a typical GR-S Type III latex compound with increasing amounts of Marmix is outlined in Figure 1. Optimum tensile strength is made possible with as little as 12% of Marmix. Where higher modulus or hardness and stiffness are desired, the Marmix content should be increased accordingly.

For Buna N type of compounds the optimum amount of Marmix which will increase tensile strength appears to be closer to 20%, as can be seen in Figure 2. Here again hardness and modulus will increase proportionally with the Marmix content.

Figures 1 and 2 also indicate the outstanding aging characteristics of compounds containing Marmix.

The compositions of the compounds, the physical properties of which are shown in Figures 1 and 2, follow:

FIGURE 1

GR-S Type III latex (solids) } Marmix Type 4950 (solids) }	100
Di-beta-naphthyl-p-phenylene diamine	1
Zinc oxide	3
Sulfur	2
Zinc dimethyl dithiocarbamate	2

Cured 40 minutes @ 212° F.

FIGURE 2

Hycar OR-15 latex (solids) } Marmix Type 4950 (solids) }	100
Di-beta-naphthyl-p-phenylene diamine	1
Zinc oxide	3 pts./100 Marmix
Sulfur	3
Zinc dimethyl dithiocarbamate	0.2
Selenium diethyl dithiocarbamate	1.0

Cured 40 minutes @ 266° F.

[1] Marbon Corp., Gary, Ind.
[2] INDIA RUBBER WORLD, 109, 577 (1944).
[3] F. S. Conover, *Rubber Age* (*N. Y.*), 58, 207 (1945); L. H. Howland, et al., INDIA RUBBER WORLD, 109, 579 (1944).

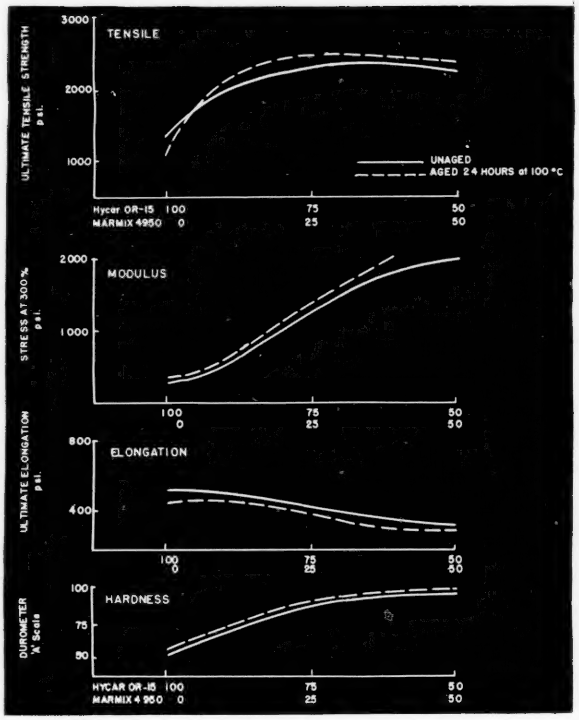

Fig. 2. Buna N-Type Latex Compounds Reinforced with Marmix

Compounding of Marmix with GR-S Latices

In all compounds the Marmix should be considered part of the elastomer constituent, and curing agents should be used accordingly. The formulation shown for GR-S has proved to be a good general formula for moderately fast cures. The antioxidant used will darken the cured products to some extent. Where emphasis is put on light colored stocks, non-staining antioxidants should be used, although their effectiveness is open to question. For rapid cures of compounds containing Marmix, Setsit No. 5 was found to be a good accelerator. It is a liquid, but may be incorporated directly into the latex mix without prior emulsification.[4] Sulfur has been kept to two parts per 100 of combined elastomer and Marmix. Larger amounts proved to be detrimental.

Compounding of Marmix with Buna N Type Latices

Although Hycar latex was used for most of this work, the results should not be construed as being less valid for other commercially available Buna N type of latices. While zinc oxide is said to be of little value in Buna N-type latex compounds, it was used in compounds containing Marmix to the extent of three parts per 100 parts of the Marmix. Table 1 shows the evaluation of several curing combinations. While the same acceleration used for GR-S compounds was quite satisfactory, the combinations 2 and 3 in Table 1 showed more promising results.

General Compounding and Testing Data

Marmix used in the work reported was of about 32% solids concentration, had a pH value of 9.5, and surface tension of 61 ± 3 dynes per centimeter.

In compounding, the following general procedure was followed. The rubber latex was stabilized with a small amount of ammonia caseinate, which at the same time thickened the latex to a desirable degree. The Marmix was then added with uniform stirring. Dispersions of the necessary curing agents, dyes, pigments, etc. were added from pebble mill dispersions. Since it is usually impossible to keep bubbles of various sizes from forming in the latex mix, it was found good practice to filter the mix through cheese cloth, keeping the bubbles floating on top by having the cloth well filled all the time. Subjecting the latex mix to a vacuum of about 15 inches will also assure removal of air bubbles. This method can be used alternately or in connection with the one described above.

To prepare films for testing, the liquid dispersion was poured on a clean flat glass plate and spread with a doctor blade. By the adjusting of the clearance between doctor blade and glass plate any desirable film thickness could be obtained. In the experimental work reported here films of about 0.015-inch thickness were prepared. The films were air dried and stripped from the glass plate as soon as they were dry. Talcum powder was applied to both film surfaces immediately to avoid sticking. After stripping the films were dried for 20 minutes in a circulating hot air over at 40° C and were then cured at a predetermined temperature in the same oven.

Testing of Films

It was found to be very important to carry on all

[4] R. T. Vanderbilt Co., Laboratory Report Booklet No. 15A.

TABLE 1. HYCAR OR-15 LATEX - MARMIX 4950—COMPARISON OF CURING AGENTS

	1	2	3	4	5
Hycar OR-115 (solids)	100	100	80	100	80
Marmix 4950 (solids)	..	..	20	..	20
Di-beta-naphthyl-p-phenylene diamine	1.0	1.0	1.0	1.0	1.0
Zinc oxide	..	0.6	0.6	..	0.6
Sulfur	3.0	3.0	3.0	3.0	3.0
Zinc dimethyl dithiocarbamate	..	0.2	0.2	2.0	2.0
Selenium diethyl dithiocarbamate	1.0	1.0	1.0	..	..

PHYSICAL PROPERTIES

Time (Min.)	Oven cure °F.	S	T	E	H	S	T	E	H	S	T	E	H	S	T	E	H	S	T	E	H
25	266		Undercured		40	265	1350	545	50	905	2240	425	78								
40	266		Undercured		50	265	1050	500	52	970	2600	465	78								
55	266	0	1170	1250	51	275	955	460	55	1200	2685	450	79								
20	212													135	865	540	53	615	1975	525	76
40	212													225	670	425	53	1500	2080	340	78
60	212													280	965	415	55	1575	1605	295	81

FILMS AGED 96 HOURS @ 70° C.

(Min.)	°F.	S	T	E	H	S	T	E	H	S*	T*	E*	H*	S	T	E	H	S	T	E	H
25	266		Undercured		52	270	1030	460	52	1010	2485	440	80								
40	266	0	1600	935	53	275	1050	460	54	1160	1925	380	80								
55	266	0	2190	765	56	275	860	430	56	1195	2160	400	80								
20	212													700	805	380	54	...	2300	290	75
40	212													785	935	360	55	...	1755	230	78
60	212													840	925	340	56	...	1880	200	80

* Films aged 36 hours at 100° C. S: Modulus at 300%, psi. T: Tensile at break, psi. E: Elongation at break, %. H: Shore "A" hardness.

TABLE 2. GR-S TYPE III LATEX AND MARMIX TYPE 4950—INFLUENCE OF HUMIDITY ON FILM STRENGTH

	1	2	3
GR-S-III (solids)—Supplier A	100	..	..
GR-S-III (solids)—Supplier B	..	100	91
Marmix 4950 (solids)	..	..	9
Di-beta-naphthyl-p-phenylene diamine	1	1	1
Zinc oxide	3	3	3
Sulfur	2	2	2
Zinc dimethyl dithiocarbamate	2	2	2

PHYSICAL PROPERTIES

	Cure @ 212° F. (Min.)	S	T	E	S	T	E	S	T	E
Tested 2 hours after curing	40	370	2140	710	400	2750	670	475	3190	670
	60	410	2200	630	370	2550	710	620	3250	635
	80	415	1535	415	375	2655	680	640	2690	600
Conditioned over calcium chloride for 48 hrs.		S	T	E	S	T	E	S	T	E
	40	400	2085	700	410	3215	665	700	3240	620
	60	495	2170	675	375	3200	585	740	3600	600
	80	440	1840	590	465	3100	620	730	3480	585
Conditioned over water for 48 hrs.		S	T	E	S	T	E	S	T	E
	40	155	900	655	210	1210	600	615	2110	600
	60	190	770	545	185	2040	575	430	2230	580
	80	190	860	570	230	2175	620	450	2370	580

S: Stress at 300% elongation, psi. T: Tensile at break, psi. E: Elongation at break %.

TABLE 3. GR-S TYPE III LATEX COMPOUND CONTAINING RECLAIM REINFORCED WITH "MARMIX"

	1	2	3	4
GR-S Type III (solids)	90	80	80	70
Reclaim* (solids)	10	10	20	20
Marmix Type 4950 (solids)	..	10	..	10
Di-beta-naphthyl-p-phenylene diamine	1	1	1	1
Zinc oxide	4	4	4	4
Sulfur	4	4	4	4
Setsit No. 5†	4	4	4	4

PHYSICAL PROPERTIES

Oven Cure @ 212° F. (Min.)	S	T	E	H	S	T	E	H	S	T	E	H	S	T	E	H
15	340	1530	610	52	700	2650	590	57	380	1630	590	52	800	2220	520	62
30	400	1540	570	52	840	2010	470	59	490	1460	500	52	950	2200	480	63
45	500	1360	480	53	970	2260	440	60	620	1220	410	52	1240	1940	345	63

FILMS AGED 24 HOURS @ 100° C.

Oven Cure @ 212° F. (Min.)	S	T	E	H	S	T	E	H	S	T	E	H	S	T	E	H
15	860	1050	320	52	...	1770	320	60	...	850	260	55	...	1660	230	69
30	...	975	300	52	...	1420	260	61	...	1000	270	55	...	1690	240	70
45	...	1180	280	53	...	1700	280	62	...	1070	270	55	...	1610	230	70

S: Stress at 300%, psi. T: Tensile at break, psi. E: Utimate elongation, %. H: Shore "A" hardness.
*Dispersion of natural rubber tire carcass reclaim. †Supplied by R. T. Vanderbilt Co.

testing under controlled conditions. The physical properties of identical films may vary greatly with changes in humidity. While some formulations will be little affected, others are apt to show very great differences in physical properties. The data in Table 2 show that films of compound No. 1 lost more than half of their tensile strength when conditioned in a desiccator over water for 48 hours before testing.

General Recommendations for the Use of Marmix

Incorporation of Marmix into a GR-S or Buna N formula enables the compounder not only to improve upon the physical properties of the finished product, but makes it possible to obtain products of wide variation in hardness and stiffness.

Where a compound of high tensile strength, high elongation, and low modulus is desired, the Marmix should be held to approximately 15 parts per 100 of elastomer. The same ratio of Marmix to elastomer is indicated where third components are introduced into the latex compound, such as dispersed reclaim. Such a compound is widely used, for instance, for the impregnating of tire cords.[5] Table 3 shows the beneficial effect of introducing Marmix into a compound of this sort. As can be seen, the Marmix restores the initial tensile strength of the latex when used in approximately equal proportions with the reclaim.

Where an increase in modulus is desired, as in certain types of latex sponge products, Marmix will prove to be of real help. Fifteen to 25 parts of Marmix to 100 parts of the elastomer will be found a good starting point.

Hardness and stiffness of a compound can be increased as desired by stepping up the amount of Marmix introduced.

For obtaining products of any desired color the conventional rubber latex dyes may be used, since Marmix seems to absorb them as readily as the elastomer.

[5] H. H. Gilman, et al., *Rubber Age* (N. Y.), 58, 591 (1946).

Developments in Silastic

(Continued from page 659)

The major limitations of the present Silastic are those of physical and mechanical strength. In many instances these relative weaknesses can be overcome through reinforcement with inorganic fabrics. Silastic in its present stage of development, however, has sufficient mechanical properties for a great many applications.

In any application where rubber-like properties are required at temperatures either above or below the serviceable limits of organic rubber or where maximum resistance to oxidation and other forms of deterioration are necessary or where good electrical insulating properties must be maintained under adverse conditions, Silastic would seem to merit careful consideration.

Alkaline Materials as Accelerators for GR-S

Joseph Breckley[1]

DURING the development of the national synthetic rubber program it was decided to utilize the rubber research and development facilities of the compounding material suppliers in an investigation to determine the best methods of formulating GR-S and other synthetic rubbers.

This investigation was directed by the Compounding Research Branch of the Office of the Rubber Director, which then collected and distributed to the participating laboratories the large amount of data gained from the many tests carried on with different accelerators, fillers, and softeners in GR-S. Included in this information were indications that the curing rate of GR-S was affected to a considerable degree by inorganic oxides and alkaline materials. Consequently this phase of the problem was investigated still further in this laboratory, and some data were released through the same agency regarding the efficacy of magnesia, litharge, and red lead as activators for some organic accelerators.

The results obtained encouraged further work to determine the effect of more strongly alkaline materials, and it was discovered that ethanolamines were very effective activators for some organic accelerators. In fact triethanolamine so strongly activates tetramethylthiuram monosulfide that a combination of the two materials will promote vulcanization of GR-S at room temperature.

Organic Bases as Primary Accelerators

Since these organic bases proved to be powerful secondary accelerators, the investigation was extended to determine the value of these and other basic materials as primary acclerators. Magnesia and litharge alone are weak accelerators for GR-S, but various amines and sodium hydroxide proved very active. Certain combinations of magnesia or sodium hydroxide with organic bases were found to be even more powerful, and even amides and inorganic ammonium salts exhibited considerable accelerating strength in the presence of magnesia. Furthermore zinc oxide was not required to develop the full strength of these materials.

Such combinations not only affect the vulcanization rate of GR-S, but they also produce vulcanizates with excellent physical properties, which in some respects are superior to those developed by normal acceleration.

Of considerable significance, also, is the fact that the cost of many of these combinations is lower than that of the more common organic accelerators required to produce an equivalent rate and state of vulcanization of GR-S.

Experimental Details

An indication of the accelerating activity of combinations of magnesia and organic bases was obtained first in a series of experiments with GR-S stocks without carbon black. In these tests (Table 1) white GR-S compounds accelerated only with magnesia (A) and triethanolamine (B) were soft, weak, and definitely undercured; whereas stocks containing both of these materials were well cured and snappy (C and D).

TABLE 1. WHITE GR-S STOCKS WITH TRIETHANOLAMINE AND MAGNESIA

Compound	A	B	C*	D
GR-S	100.0	100.0	100.0	100.0
Titanium dioxide	25.0	25.0	25.0	50.0
Zinc Oxide	2.0	2.0	2.0	2.0
Turgum	5.0	5.0	5.0	5.0
Magnesia	10.0	..	5.0	4.0
Triethanolamine	..	5.0	2.5	1.5
Sulfur	4.0	4.0	4.0	4.0

*Compound C was a blend of A and B.

PHYSICAL PROPERTIES

	Original				After Air Oven Aging, 136 Hrs. @ 100° C.		
Cpd.	Cure @ 287° F. Mins.	Tens. PSI	Elong. %	Mod. 300% PSI	Tens. PSI	Elong. %	Mod. 300% PSI
A	30	625	1000	125	1090	650	295
B	30	260	1150	65	710	575	260
C	30	1080	625	310	1350	510	685
D	15	1275	885	185	1320	510	515
D	30	1750	665	335	1660	480	650

Additional tests with black stocks (Table 2), with smaller amounts of magnesia and triethanolamine, show that magnesia alone (A) has little value as an accelerator for GR-S, but that triethanolamine by itself is fairly active (B). The activity of triethanolamine is increased considerably by the presence of magnesia (C and D), but is retarded by zinc oxide (E). It will be noticed also that after aging, the physical properties of C and D are considerably better than B. Compound F demonstrates still further the activity and good aging characteristics of these combinations.

TABLE 2. BLACK GR-S STOCKS WITH TRIETHANOLAMINE AND MAGNESIA

Compound	A	B	C	D	E	F
GR-S	100.0	100.0	100.0	100.0	100.0	100.0
HMF black	20.0	20.0	20.0	20.0	20.0	20.0
Zinc oxide	..	..	..	..	2.0	..
Magnesia	5.0	..	1.0	2.0	..	2.0
Triethanolamine	..	1.0	1.0	1.0	1.0	2.0
Sulfur	3.0	3.0	3.0	3.0	3.0	2.0

PHYSICAL PROPERTIES

	Original				After Air Oven Aging, at 100° C.—4 days		
Cpd.	Cure @ 287° F. Mins.	Tens. PSI	Elong. %	Mod. 300% PSI	Tens. PSI	Elong. %	Mod. 300% PSI
A	15	65	1300	...	...	...	...
A	30	250	1150	...	...	...	...
B	15	695	1025	100	1100	525	385
B	30	1100	735	200	1245	395	740
B	45	1215	625	295	1090	330	910
C	15	905	900	165	2115	600	625
C	30	1730	710	365	2070	460	990
C	45	1910	610	475	2190	440	1155
D	15	1190	875	190	2410	600	790
D	30	1750	635	410	2030	420	1150
D	45	1875	550	590	2315	400	1475
E	30	80	1425	25	...	...	...
E	45	210	1375	55	...	...	...
F	15	1540	725	345	2080	540	875*
F	30	2110	635	545	2340	540	975*
F	45	2360	620	640	2430	535	1025*

* Aged 89 hours.

Combinations of magnesia with primary, secondary, and tertiary amines; quaternary ammonium bases; and polyethyleneamines are also very active accelerators for GR-S, as can be seen from the data in Table 3. The comparison of these amines in GR-S was made on an equivalent weight basis, i.e., the molecular weight of the respective amines and the number of amine nitrogens in each were used in determining the amounts used.

TABLE 3. MAGNESIA AND VARIOUS AMINES AS ACCELERATORS FOR GR-S

Compound	A	B	C	D	E
GR-S	100.0	100.0	100.0	100.0	100.0
HMF black	20.0	20.0	20.0	20.0	20.0
Magnesia	2.0	2.0	2.0	2.0	2.0
Monethanolamine	0.4	..	..	..	..
Diethanolamine	..	0.7	..	..	..
Triethanolamine	..	..	1.0	..	..
Tetraethanolamine ammonium hydroxide, 40%	..	..	..	3.5	..
Tetraethylene pentamine	..	..	..	..	0.25
Sulfur	3.0	3.0	3.0	3.0	3.0

[1] Titanium Pigment Corp., 111 Broadway, New York, N. Y.

Physical Properties

Cpd.	Cure @ 287° F. Mins.	Original Tens. PSI	Original Elong. %	Original Mod. 300% PSI	After Air Oven Aging, at 100° C.—4 days Tens. PSI	Elong. %	Mod. 300% PSI
A	15	570	1060	110	1975	750	410
A	30	1235	835	210	2150	585	675
A	45	1775	750	295	2255	505	945
B	15	980	925	160	2260	590	665
B	30	1645	725	305	2050	530	1030
B	45	2080	640	465	1770	350	1525
C	15	1190	875	190	2410	800	790
C	30	1750	635	410	2030	420	1150
C	45	1875	550	590	2515	400	1475
D	15	1720	755	305	2600	520	1030
D	30	1850	545	585	2150	410	1300
D	45	1800	480	735	1975	365	1455
E	15	1900	775	320	1730	400	1125
E	30	2000	540	670	1880	375	1360
E	45	1730	450	820	1550	315	1445

Monoethanolamine and polyethyleneamines were compared in compounds containing no magnesia (Table 4). The amine content here was increased because of the absence of magnesia from these formulations. It will be noticed that even under these conditions, all of these materials are active accelerators for GR-S.

Table 4. Amines Alone as Accelerators

Compound	A	B	C	D
GR-S	100.0	100.0	100.0	100.0
HMF black	20.0	20.0	20.0	20.0
Monoethanolamine	0.8	..	..	..
Ethylenediamine, 70%	..	0.57	..	..
Triethylenetetramine	..	..	0.47	..
Tetraethylenepentamine	..	..	..	0.5
Sulfur	3.0	3.0	3.0	3.0

Physical Properties

Cpd.	Cure @ 287° F. Mins.	Original Tens. PSI	Original Elong. %	Original Mod. 300% PSI	After Air Oven Aging, at 100° C.—4 days Tens. PSI	Elong. %	Mod. 300% PSI
A	15	1115	815	175	1025	365	690
A	30	1590	550	385	1025	275	...
B	15	1020	960	115	930	390	555
B	30	1380	685	255	880	290	820
C	15	1365	775	205	1010	360	945
C	30	1505	560	460	1340	310	1280
D	15	1350	750	235	1335	370	925
D	30	1580	560	475	1145	265	...

However, according to the data in Table 5, a combination of magnesia and tetraethylenepentamine (D and E) will produce faster curing stocks with better physical properties, both before and after aging, than appear possible with the amine alone.

Table 5. Amine and Magnesia in GR-S

Compound	A	B	C	D	E
GR-S	100.0	100.0	100.0	100.0	100.0
HMF black	20.0	20.0	20.0	20.0	20.0
Magnesia	..	..	..	2.0	2.0
Tetraethylenepentamine	0.5	1.0	3.0	0.5	1.0
Sulfur	2.0	2.0	2.0	2.0	2.0

Physical Properties

Cpd.	Cure @ 287° F. Mins.	Original Tens. PSI	Original Elong. %	Original Mod. 300% PSI	After Air Oven Aging, at 100° C.—4 days Tens. PSI	Elong. %	Mod. 300% PSI
A	10	710	915	135	920	385	580
A	15	1125	825	205	925	335	720
A	20	1415	770	245	900	310	835
A	30	1600	640	400	810	265	...
B	10	1500	860	210	740	275	...
B	15	1805	745	350	670	230	...
B	20	1825	665	415	645	220	...
B	30	1880	615	500	590	195	...
C	10	1705	900	205	1150	390	790
C	15	1810	750	280	1100	350	850
C	20	1820	660	380	1000	330	875
C	30	1665	645	425	720	250	...
D	10	1535	785	290	1800	385	1080
D	15	1635	665	450	1545	345	1255
D	20	1710	510	530	1280	280	...
D	30	1960	525	735	1300	285	...
E	10	2000	745	415	1975	425	1100
E	15	2310	640	535	1710	350	1295
E	20	2285	590	670	1910	355	1430

Experiments with sodium hydroxide show that it is an accelerator for GR-S and that a combination of the hydroxide with monoethanolamine is also very active. The results of this work are given in Table 6.

Table 6. Sodium Hydroxide and Monoethanolamine in GR-S

Compound	A	B	C	D
GR-S	100.0	100.0	100.0	100.0
HMF black	20.0	20.0	20.0	20.0
Sodium hydroxide	1.5	..	..	1.0
Monoethanolamine	..	1.0	1.5	0.5
Sulfur	3.0	3.0	3.0	3.0

Physical Properties

Cpd.	Cure @ 287° F. Mins.	Original Tens. PSI	Original Elong. %	Original Mod. 300% PSI	After Air Oven Aging, at 100° C.—4 days Tens. PSI	Elong. %	Mod. 300% PSI
A	15	1015	775	160	1670	480	690
A	30	1520	630	320	1715	410	990
B	15	1100	755	200	1000	380	670
B	30	1350	535	445	1100	275	...
C	15	1520	715	280	1220	350	915
C	20	1520	605	405	1165	300	1165
C	30	1465	515	555	1025	245	...
D	15	1475	690	300	1595	420	880
D	20	1550	615	370	1715	390	1050
D	30	1810	560	530	1520	325	1335

As stated earlier, the combinations of organic bases with magnesia or sodium hydroxide not only are active accelerators for GR-S, but they also produce vulcanizates with excellent physical properties. A comparison between GR-S tread stocks accelerated with some of these combinations and accelerated with Santocure (N-cyclohexyl-2-benzothiazyl-sulfenamide) is given in Table 7.

Table 7. Organic and Inorganic Base *vs.* Normal Acceleration for GR-S

Compound	A	B	C
GR-S	100.0	100.0	100.0
EPC black	20.0	20.0	20.0
HMF black	20.0	20.0	20.0
Paraflux	5.0	5.0	5.0
Zinc oxide	3.0	..	..
Santocure	1.2	..	..
Monoethanolamine	..	2.0	1.5
Magnesia	..	2.0	..
Sodium hydroxide	..	..	1.5
Sulfur	2.0	3.0	3.0

Physical Properties

Cpd.	Cure @ 287° F. Mins.	Original Tens. PSI	Original Elong. %	Original Mod. 300% PSI	After Air Oven Aging at 100° C. 24 Hours Tens. PSI	24 Hours Elong. %	24 Hours Mod. 300% PSI	4 Days Tens. PSI	4 Days Elong. %	4 Days Mod. 300% PSI
A	20	2220	850	375	1565	250	...	1885	225	...
A	30	2890	675	730	1930	290	...	1955	.220	...
A	45	2690	575	915	1820	305	1780	1610	220	...
A	60	2620	545	1000	1575	285	...	1770	240	...
B	20	2800	675	705	3050	575	1200	2980	445	...
B	30	3130	620	905	2925	490	1450	2900	410	1980
B	45	2880	545	1085	2750	445	1570	2760	375	2100
B	60	2900	515	1210	2800	440	1670	2715	375	2180
C	20	2680	635	675	2780	515	1270	2610	400	1840
C	30	3040	600	935	2700	455	1500	2460	360	2000
C	45	2800	545	1020	2700	440	1590	2450	350	2040
C	60	2900	530	1100	2250	375	1720	2375	335	2100

Hot Bend Flexing at 100° C.

Flex Cycles		350	500	750	1000	2000	3000	4000	8700	10000
A 60 min.	Crack width	.15	.20	.35	.40	.75	.85	1.00*	..	..
3 60 min.	in	.05	.05	.05	.10	.20	.30	.40	.85	.85
C 60 min.	inches	.05	.05	.10	.15	.35	.40	.50	.70	.70

* Sample cracked entirely through.

Note: These samples were flexed according to ASTM Method D 13-44T with the exception that the hole in the sample penetrated to about 0.05-inch instead of completely piercing the sample, and the flexing was conducted at 400 instead of 300 cycles a minute.

Since the more lightly loaded a GR-S stock is, the less heat it will generate during flexing, some work was done to learn if it were possible to develop a low-black GR-S carcass stock with good physical properties by utilizing some of these accelerator combinations of organic and inorganic bases. The results of these tests are given in Table 8.

Table 8. Varying Black Content with Basic Acceleration

Compound	A	B
GR-S	100.0	100.0
HMF black	15.0	12.5
Paraflux	5.0	5.0
Magnesia	2.0	1.5
Tetraethylenepentamine	0.5	0.375
Sulfur	3.0	3.0

Physical Properties

		Original			After Air Oven Aging, at 100° C.—4 days		
Cpd.	Cure @ 287° F. Mins.	Tens. PSI	Elong. %	Mod. 300% PSI	Tens. PSI	Elong. %	Mod. 300% PSI
A	10	1800	690	380	1500	395	945
A	15	1845	560	570	1450	345	1130
A	20	1565	465	690	1440	335	1210
A	30	1370	400	825	1335	290	...
B	10	1640	815	250	1365	420	745
B	15	1460	615	350	1350	370	915
B	20	1535	570	435	1365	355	995
B	30	1445	495	550	1210	295	...

Heat Build-Up—Goodrich Flexometer

			Compression—%			
	Mins. Cure	Temp. F.*	Static	Initial Dyn.	Final Dyn.	% Perm. Set
A	45	66	19.2	8.9	8.9	3.6
B	45	72	21.8	11.6	11.6	5.0

* Temp. F. equals temperature rise in degrees Fahrenheit.
Note: Conditions of the test were: duration, 30 mins.; load, 100 psi; stroke, 0.2-inch. Sample A was tested at 72° F. and B at 76° F.

Butadiene-Acrylonitrile Polymers

The effectiveness of combinations of organic and inorganic bases as accelerators for butadiene-acrylonitrile copolymers was also investigated, and it was found that tetraethylenepentamine and magnesia were an active accelerator combination for Hycar OR and Perbunan 26.

Table 9. Amine and Magnesia with Buna N

Compound	A	B
Hycar OR-15	100.0	..
Perbunan 26	..	100.0
HMF black	20.0	20.0
Bardol	20.0	15.0
Magnesia	2.0	2.0
Tetraethylenepentamine	0.5	0.5
Sulfur	2.0	2.0

Physical Properties

		Original			After Air Oven Aging, at 100° C.—4 days		
Cpd.	Cure @ 287° F. Mins.	Tens. PSI	Elong. %	Mod. 300% PSI	Tens. PSI	Elong. %	Mod. 300% PSI
A	10	2500	750	450	2475	340	2125
A	15	3195	650	670	2940	355	2240
A	30	2420	490	960	3100	345	2480
B	5	1645	775	265	1940	385	1250
B	10	2170	575	570	2210	380	1375

Discussion

Many other products having strong basic properties also produce results similar to those recorded in this paper. Among these are long-chain aliphatic amines; the aromatic amine, benzylamine; and the closed ring aliphatic amines, piperdine and morpholine.

The weak bases, pyridine, aniline, and hexamethylene tetramine, exhibit little activity, even in the presence of magnesia. Various amides and salts of amines such as urea, acetamide, and long-chain aliphatic amine acetates, are inactive when used alone, but are fairly active in the presence of magnesia.

Although GR-S stocks accelerated with some of these combinations did not vulcanize in several hours at 100° C., there is the possibility that many of them might be somewhat "scorchy" in regular production use.

Also, some of the amines may be somewhat toxic, and this factor should be evaluated before considering them for factory use.

The author is grateful to A. W. Robertson for permission to publish this paper and to Harry L. Fisher for his helpful comment and criticism.

"The American and Amerigear Flexible Couplings." Catalog No. 461. American Flexible Coupling Co., Erie, Pa. 32 pages. This booklet describes the company's line of couplings. Illustrations are shown, and discussions cover installation and operation, factors of design, engineering data, load factors.

Statistical Control

(Continued from page 656)

thing is wrong with the test or the sample and hence indicates that the observed results should be discarded. Figure 5 is thus also a control measure for determining the acceptability of test results.

Control Charts Determine Reliability of Results and Equipment Accuracy

We have now given a slightly oversimplified explanation of two control charts for use in a physical testing laboratory. A control chart can be set up for one or more reference standards on each of the physical tests made on rubber. These control charts act as guides in determining whether or not the equipment is functioning properly. The information derived from the data plotted on the control charts becomes the basis for evaluating the reliability of the test results put out by the physical testing laboratory.

These charts of reference standards can also be used profitably in determining the accuracy of the test equipment. Refer again to Figure 3. The average quality line is found at 50 Mooney. It is relatively easy to determine whether this is comparable to other plastometers in the same or other plants. If the true value of the standard used is found to be 45 instead of 50, not only are the samples of standard, but all samples are being incorrectly evaluated.

The same general principle can be applied to tensile testing. An adequate estimate of the true value is more difficult to obtain here than in some other tests, but can be satisfactorily obtained.

A common reaction to these methods is the feeling that physical testing equipment can be adequately checked and controlled by mechanical means such as calibration with weights and wires. Our experience has been that these methods are not adequate and are no substitutes for statistical control.

Summary and Conclusions

In conclusion, may I repeat that the statistical methods find a useful and important application in the control of physical testing of rubber. An attempt has been made to show how the physical testing of rubber might yield more useful information if these methods were adopted.

The illustrations and examples given have been of a very general nature. It is hoped, however, that they are of sufficiently fundamental nature to point the way to specific uses in any laboratory.

Publications of the Hercules Powder Co., Wilmington, Del. **"Hercules Products."** 44 pages. The company's chemicals and industrial explosives listed herein are first indexed according to the various industries using these materials and then according to chemical groups. Industries covered include rubber, plastics, paints, adhesives, and others. Products discussed are the cellulose family, rosin family, synthetic resins, terpene solvents and chemicals, chlorinated products, explosives, and special materials. **"Comparison of GR-S-10 and GR-S with Various Fillers."** Hercules Technical Bulletin No. 1. 2 pages. This is the first of a series to point out the advantages of GR-S-10 over regular GR-S, and of resin softeners in non-black rubber compounds. This bulletin covers the use of hydrated alumina in GR-S-10 and GR-S formulations containing no softener, and compounds containing Staybelite Resin and Cumar MH. Data on effect on physical properties of the vulcanizates are given.

EDITORIALS

Second Report of the Batt Committee

THE Second Report of the Inter-Agency Policy Committee on Rubber of the Office of War Mobilization and Reconversion was made public on July 29. This report, which includes a republication of the Interim Report of the Committee of June 13, was forwarded to President Truman, the President of the Senate, and the Speaker of the House on July 22, following a resolution passed by the Senate on July 11, which stated that:

"Notwithstanding the provisions of Section 19 of the Surplus Property Act, no synthetic rubber plants costing the Government in excess of $5,000,000 be disposed of until six months after submission to Congress of a report and recommendations by the Director of War Mobilization and Reconversion with respect to the establishment of a comprehensive national rubber program."

Having failed by its Interim Report to obtain authority from Congress during the present session for the disposal of the government-owned synthetic rubber plants, the Inter-Agency Committee nevertheless moved to avoid another possible six or eight months' additional delay by presenting the required report during the last days of the present session of Congress rather than at the beginning of the next.

This Second Report of the Committee, while being an admirable and extensive document, still does more toward reemphasizing the many dilemmas confronting the Committee than it does to provide a complete and clear-cut solution of many of them. A case in point is the matter of what to do about the existing patent agreements and technical information exchange agreements in the copolymer and butadiene and styrene fields.

With regard to the copolymer field, the Committee, realizing that the present agreements may restrain future competitive operation of the industry and inhibit the development of new processes and new polymers, but still of necessity concerned with the problem of protection against litigation during the remaining period in which plants are operating for the account of the government, could not see its way clear to recommend the cut-off date of March 2, 1946, for the exchange of all patent rights and technical information thereafter acquired, although this date was being considered by signatories to the Cross-Licensing Agreement. Instead the Committee made the following indefinite recommendation:

"The Committee recognizes that any solution to the problem presented by the patent agreements as to future discoveries in the copolymer field will have certain disadvantages. It believes, however, that the least undesirable policy would be to terminate the provisions of these agreements relating to new discoveries as to all signatories on a uniformly applicable cut-off date. It would seem most appropriate that the uniform cut-off date be made to coincide with the time at which this basic block of plants if disposed of."

This means that in all probability the Cross-Licensing Agreement will remain in force for almost another year, and the advantages of competitive research on synthetic rubber by private industry will not be realized to any great extent during that time. Of course the attitude of the Reconstruction Finance Corp. on this matter may have been a major factor in preventing the immediate elimination of the Cross-Licensing Agreement. Charles B. Henderson, chairman of the RFC, in a letter to William L. Batt, chairman of the Rubber Policy Committee, dated July 17, made the following statement:

"This Corporation, however, is opposed to any modifications of such agreements which may restrict the operations of Government, reduce the licensing rights and technical information which can be made available to purchasers of the plants, or limit the quality improvement or output of government-produced rubber and thus discriminate against the many consumers of such rubber."

Actually, the "many consumers of such rubber" will be discriminated against more and the quality improvement or output of government-produced rubber will be limited more by the continuation of the Cross-Licensing Agreement for another year than they would be if the Agreement were terminated at once. It was suggested in these columns in June that this Cross-Licensing Agreement should be discontinued immediately if vigorous research on synthetic rubber was to be expected from now on. A method was also suggested whereby, under existing patent laws, the government should purchase licenses from private companies or individuals, if this was found necessary in order to operate the government-owned plants to produce synthetic rubber of equal quality to that being produced by private industry, (assuming the rubber produced by the latter was superior), and pay royalties to the owners of the patents. If government-financed research develops a better polymer or process, industry, in this special case, should be required to purchase a license from the government and pay royalties for such use.

Licenses granted up to the cut-off date should be royalty-free to operators of government plants and plants purchased from the government for the life of such patents. It should make no difference whether a private operator of a plant purchased from the government had been a former operator of a government plant or not, but after a cut-off date has been declared, and the sooner the better, operators of government plants and operators of private plants should be in actual real competition with each other. However at the earliest possible date the majority of government plants should be disposed of to private industry, and the government's activity in research on synthetic rubber should be entirely of the fundamental long-range type, "not directed with a view toward usefulness in any of our present processes or plants," as recommended in the First Report of the Batt Committee.

Scientific and Technical Activities

A. C. S., Division of Rubber Chemistry, Fall Meeting

THE one hundred tenth meeting of the American Chemical Society will be held in Chicago, Ill., September 9 through 13. The Division of Rubber Chemistry will have technical sessions starting on the afternoon of September 11 and continuing with morning and afternoon sessions on September 12 and 13. The headquarters of the Division will be at the Hotel Sherman, where the technical sessions, the business meeting and the banquet all will take place.

The Charles Goodyear Medal will be awarded to Ira Williams, of J. M. Huber, Inc., who will deliver a lecture on "The Vulcanization of Rubber with Sulfur," at 10:10 a. m. the morning of September 12. This Charles Goodyear Medal, in commemoration of the discovery of the vulcanization of rubber, is awarded annually to a person who has made a valuable contribution to the science or technology of rubber or related subjects. Because of the suspension of meetings of the Society during the latter part of the war, this award is for the year 1945, and the 1946 medalist has not yet been selected. Waldo L. Semon, who gave his lecture at the 1946 spring meeting, received the award for 1944.

The Division of Rubber Chemistry is collaborating with the Divisions of Cellulose; Colloid; Organic; Paint, Varnish and Plastics; and Physical and Inorganic Chemistry in the second "High-Polymer Forum." This forum, sponsored at this meeting by the Division of Physical and Inorganic Chemistry, is scheduled for morning and afternoon sessions on September 10 and 11. Herman F. Mark, of Polytechnic Institute of Brooklyn, is chairman of the forum committee which includes the secretaries of the other Divisions participating in the forum.

Meeting Details

Hotel reservation cards have been sent to all members and associate members of the Rubber Division by the secretary, H. I. Cramer, Sharples Chemicals, Inc., Philadelphia, Pa., and a preliminary program for the whole meeting appeared in the June 10 issue of *Chemical and Engineering News*. A general letter to the membership of the Division will be mailed by the secretary early in August.

The committee on local arrangements is composed of F. S. Frost Jr., Frost Rubber Works, as chairman; with Bruce Hubbard, Ideal Roller & Mfg. Co., housing; L. S. Winkelmann, Dryden Rubber Co., entertainment; and W. N. Crumpler, Geo. S. Mepham Corp., tickets and registration.

The Division's banquet, scheduled for September 12, will be held in the Grand Ballroom of the Hotel Sherman. *Advance reservations at $7 per person should be made with R. C. Dale, of Inland Rubber Corp., 33 S. Clark St., Chicago 3.* In accordance with the usual custom, it is expected that officers of the Society will be invited to be present at this affair.

Divisional Program and High Polymer Forum

The program of the Division of Rubber Chemistry, which begins on the afternoon of September 11, is given below in a very condensed form, and the abstracts of the papers to be presented follow under "Abstracts of Division Papers." W. A. Gibbons, United States Rubber Co., chairman of the Division, will preside at the technical sessions, the business meeting, and the banquet.

The High Polymer Forum will be presided over on the morning of September 10, by Dr. Mark; during the afternoon of September 10, by Dr. Cramer; on the morning of September 11, by H. M. Spurlin, Hercules Powder Co.; and during the afternoon of September 11, by P. D. Bartlett, Harvard University.

RUBBER DIVISION PROGRAM

September 11—Afternoon Session
W. A. Gibbons, Presiding

2:00 p.m. Introductory Remarks by W. A. Gibbons.

2:10 p.m. Technical Session.

September 12—Morning Session
W. A. Gibbons, Presiding

9:00 a.m. Technical Session.

10:10 a.m. Charles Goodyear Medal Award to Ira Williams. Lecture on "The Vulcanization of Rubber with Sulfur."

10:55 a.m. Technical Session.

September 12—Afternoon Session
W. A. Gibbons, Presiding

2:00 p.m. Technical Session.

2:40 p.m. Business Meeting.

2:55 p.m. Technical Session

September 12—Evening

7:00 p.m. Divisional Banquet. Grand Ballroom, Hotel Sherman.

September 13—Morning Session
W. A. Gibbons, Presiding

9:00 a.m. Technical Session.

September 13—Afternon Session
W. A. Gibbons, Presiding.

2:00 p.m. Technical Session.

Abstracts of Division Papers

The abstracts of the papers to be presented before the Division of Rubber Chemistry starting on the afternoon of September 11, together with the authors and their company or other affiliations, are given below:

Wednesday Afternoon—September 11

Disproportionated Rosin Soap (Dresinate 731) as the Emulsifier in the GR-S Polmerization. Disproportionated rosin soap (Dresinate 731) is a polymerization emulsifier which gives GR-S rubbers with outstanding properties at uniformly acceptable polymerization rates. This paper describes the chemical changes involved in the disproportionation reaction and the effects of the constituents of the disproportionated product on the polymerization reaction.

The resin acids known to be present in disproportionated rosin, all form soaps satisfactory for use as emulsifiers in the GR-S polymerization. The abietic-type acids, the major acid constituents of commercial rosins, are definitely harmful, but are converted to satisfactory acids in the disproportionation process. Isomeric acids having the dextropimaric skeleton, which are present in small quantities in commercial rosins, do not appear to exert the inhibiting effects characteristic of the abietic-type acids.

After the conversion of the original resin acids of rosin to satisfactory materials by the disproportionation reaction, further refining is necessary to obtain a product which gives best results in polymerization. This may be accomplished by processes such as absorbent earth refining, distillation, crystallization, or solvent extraction. This additional refining step is necessary because of the presence of phenolic materials in the neutral portion of disproportionated rosin. These materials have been concentrated, characterized as phenols, and shown to be powerful polymerization inhibiters.

As a result of the application of the conclusions from this work, a commercial plant is now in operation producing a uniform disproportionated rosin soap (Dresinate 731) with polymerization activity approaching the maximum values which can be attained with pure resin acid soaps. J. T. Hayes, A. E. Drake, Hercules Powder Co., Wilmington 99, Del., and Y. T. Pratt, University of Maryland, College Park, Md.

Emulsion Polymerization of Synthetic Rubber with Dehydrogenated Rosin Soap and Tertiary Mercaptan Modification. In manufacturing synthetic rubber it is advantageous to leave the fatty acid which results from acid coagulation of the latex in the rubber. Consequently the properties of the rubber depend in part on the type of emulsifying agent employed in its preparation. The substitution of fatty acid soap by dehydrogenated rosin soap results in a rubber exhibiting better building tack and higher tensile properties. The depletion characteristics during polymerization of tertiary mercaptans commend their use with dehydrogenated rosin soap. Therefore a systematic investigation has been conducted on the copolymerization of a butadiene-styrene mixture, emulsified by dehydrogenated rosin soap and modified by lorol mercaptan, by tertiary dodecyl, tetradecyl, and hexadecyl mercaptans, and by a 3-1-1 mixture of the tertiary mercaptans.

It has been found that, except for tertiary hexadecyl mercaptan, all of the mercaptans used in equivalent amounts result in identical polymerization rates. With the tertiary hexadecyl mercaptan a slightly longer reaction time is required. However, owing to higher modifier efficiency, smaller amounts of tertiary mercaptans, as compared with lorol mercaptan, must be used. This introduces a variation in reaction rate since the velocity of polymerization with tertiary mercaptans is not independent of concentration, as is the case with lorol mercaptan in amounts higher than 0.1 part of the monomers. Accordingly the amounts of mercaptans required to give 55 Mooney viscosity rubbers at 72% conversion and the times required to reach

this conversion for each of the modifiers have been determined using 12-ounce crown-capped bottles as reaction vessels.

The phenomenon of retardation of mercaptan modified recipes by ammonia has been investigated and found most interesting. The retardation occurs with all mercaptans when they are present in such amounts that variation of concentration of the mercaptan produces a change in the rate of polymerization. The effect is observed in both fatty acid and dehydrogenated rosin soap emulsified systems. Ammonia retardation of tertiary mercaptan modified systems is more pronounced than is observed with normal mercaptans. However ammonia retardation, while affecting the rate of polymerization, has little, if any, effect on modification or on the rate of mercaptan depletion as a function of conversion. Several ways of overcoming this retardation have been found. C. F. Fryling, Hydrocarbon Chemical Co., Bartlesville, Okla.

Emulsion Copolymerization of Isoprene and Styrene. The emulsion copolymerization of isoprene, obtained from terpenes, with styrene was investigated. The yield of polymer produced (per cent. hydrocarbon conversion), the solubility in benzene, and the intrinsic viscosity (in dilute benzene solution) of the isoprene-styrene polymers obtained are reported. The isoprene-styrene ratio was varied from 85:15 to 65:35. The effect of two catalysts, potassium persulfate and benzoyl peroxide, and four mercaptans, normal dodecyl and normal tetradecyl and tertiary dodecyl and tertiary tetradecyl, were investigated. Certain details of technique used are given.

Polymerizations were generally carried out at $50.0 \pm 0.1°$ C. with two milliliters of 2.5% soap solution per gram of hydrocarbon monomer for periods of 12 to 18 hours. Purity of the isoprene used markedly affected the polymerization. With potassium persulfate as the catalyst, the amount of mercaptan used markedly affected the solubility and intrinsic viscosity, but had little effect on the yield except at the lower levels of tertiary mercaptan. However with benzoyl peroxide as the catalyst the amount of mercaptan used, and the ratio of mercaptan to peroxide, markedly affected the yield as well as the solubility and viscosity. In general both yield and intrinsic viscosity were considerably lower with benzoyl peroxide than with potassium persulfate. With normal dodecyl and normal tetradecyl mercaptan as the modifiers and potassium persulfate as the catalyst, yields of polymers in excess of 82% were obtained in 14 hours. A. J. Johanson and L. A. Goldblatt, U. S. Dept. Agriculture, New Orleans, La.

Relation of Latex Droplet Size to Synthetic Rubber Properties and High Solids Latex Fluidity. It is well known that conventional synthetic rubber latices have, on the average, a much smaller droplet size than natural rubber latices. Among the factors affecting synthetic latex particle size are: type and concentration of emulsifier, water/monomer ratio, agitation, conversion, and electrolyte concentration. Data are presented illustrating the relation of soap concentration to average droplet size of the final latex.

Physical properties of butadiene/styrene rubbers from emulsions stabilized with a wide range of soap concentrations show that latex particle size has at most only a slight effect on rubber quality. This observation is discussed in the light of predictions by others that synthetic rubber of remarkably improved quality should result if the polymerization chemist could obtain latex droplets similar in size to those of *Hevea* latex.

Most of the latex particle measurements described were by total surface titration with soap. Confirmatory determinations by other methods and estimation of distribution of droplet sizes are warranted by the aid these data have been in practical latex problems.

The most useful application resulting from the present study of droplet diameters is the commercial preparation of synthetic latices of high solids content, i. e., 55-60% totals solids. Synthetic latices in this solids range may be prepared by several methods of concentration of ordinary dilute latices. These methods, however, are costly and require special equipment. Methods for preparation of high solids synthetic latices by direct polymerization in the reactor have been recently described which involve the use of high concentrations of emulsifiers and auxiliary viscosity reducing agents. Droplet sizes of such latices are only slightly larger than in ordinary GR-S latex.

For latices free of viscosity reducing agents it has been established that high solids latex fluidity can be increased by increasing particle size. By control of particle size, 55-60% solids latices have been made directly in commercial reactors without the use of auxiliary viscosity reducing agents. The average latex droplet diameter is kept large by forming the initial emulsion with a low concentration of soap, followed by subsequent soap, additions after polymerization has proceeded beyond a critical point where addition of soap no longer causes formation of many small droplets. In this way latices of large average particle size may be formed which contain sufficient soap for product stability. The same total amount of soap causes extremely fine particles if it is all charged initially. The large particles are important not only to fluidity of the final latex, but to stability of the emulsion during polymerization. Without the soap addition technique low water charges necessary for a 60% solids latex pass through an extremely viscous, gel-like stage which does not permit adequate heat transfer.

With optimum scheduling of soap additions and with modified agitation, a 60% total solids latex of butadiene/styrene rubber has been made in full-scale equipment and shipped in tank cars. The high concentration of actual rubber and the low concentration of non-rubber constituents of this product are important in many latex applications. A. M. Borders and R. M. Pierson, Goodyear Tire & Rubber Co., Akron, O.

The Effect of Traces of Inhibiters on Synthetic Rubber Polymerizations. In synthetic rubber production an inhibiter is sometimes added to the polymerization batch in the reaction vessel when the desired degree of monomer conversion has been reached. The batch is then withdrawn, and the reactor recharged. When this technique is applied in a five-gallon pilot-plant unit, erratic and markedly slower reaction periods result than if interruption of the polymerization process is carried out in a separate vessel. This condition has been attributed to the presence in the reactor of inhibiter traces carried over from batch to batch. It has been found that fast polymerization recipes are more retarded by the presence of inhibiters than are slower formulae. F. W. Breuer, Armstrong Cork Co., Lancaster, Pa.

Development of GR-S-65. During the war military and other essential requirements for wire insulation placed emphasis on the need of a large volume of a new GR-S type of synthetic with a lower water absorbing tendency than the standard material. It was assumed that creaming salt retained by the finished polymer was responsible for this tendency.

Attempts to coagulate with sulfuric acid alone in conventional equipment resulted in a floc that was extremely tacky and could not be satisfactorily handled in subsequent operations at the copolymer plant.

Experiments were run using equipment employed in the alum coagulation of GR-S, consisting essentially of two concentric pipes so arranged as to introduce compressed air and latex beneath the acid solution surface. While some improvement was realized, the subsequent operations were still difficult because of floc tackiness.

In combination with the use of this equipment, various protective agents were added to the coagulant to reduce stickiness. Glue was found the most satisfactory. By properly adjusting latex and air flow rates and glue concentration, a suitable coagulum was obtained. As predicted, the polymer thus obtained had an extremely low water absorption.

Successful production plant operation was realized at a cost comparable to GR-S. The product, GR-S-65, was widely accepted by the wire and cable industry and has been manufactured in large quantities since December, 1944. It is superior in water absorption to other available GR-S types and to rubber, even after immersion for several months. In other properties it is equivalent to standard GR-S. J. C. Madigan, E. L. Borg, R. L. Provost, and W. J. Mueller, U. S. Rubber, Institute, W. Va.

Governmental Activities in the Production of Synthetic Rubber. As is well known, the United States Government has sponsored the creation and operation of the largest single chemical industry in the world. This paper reviews the early history of this effort, together with some general detail of the operations as they are conducted. The author reviews the mechanism of collaboration between the government and industry in the exchange of technical information, the maintenance of production standards, and the program for the improvement of the product which is rigorously followed. In addition the various programs for safety work, property maintenance, and other operational details are reviewed.

The author also details some of the work and development concerning synthetic latices whose production has reached very large tonnage at this time. A view of currently produced experimental polymers concludes the paper. W. R. Hucks, Office of Rubber Reserve.

Thursday Morning—September 12

The Measurement of Internal Double Bonds in Polymers by Perbenzoic Acid Addition. A procedure is described for determining the amount of 1,4 addition in polymers. The method is based on the more rapid addition of perbenzoic acid to internal double bonds than to vinyl double bonds resulting from 1,2 polymerization. The contribution of vinyl double-bond addition is substracted

by extrapolation of the polymer reaction rate curve obtained under the experimental conditions described.

Prepared mixtures of oleic and 10-undecylenic acids were used to test the procedure, and the range of applicability of the method was found to be 70 to 100% internal double bonds. This range includes nearly all polymers with the exception of those polymerized with alkali-metal catalysts.

Experimental conditions influencing the addition rate and side chain oxidation were investigated. These include degree of excess perbenzoic acid, temperature, solvent medium, and age of reagent. The optimum conditions found are 25% surplus of perbenzoic acid in chloroform solution reacting at 6° C.

Several preparations of GR-S, polybutadiene, polyisoprene, polydimethylbutadiene, and natural rubber have been measured. The presence of a side-chain methyl group favors 1,4 polymerization. A trend toward higher internal double bond contents in GR-S systems of low pH was noted. Measurements on a series of GR-S fractions of different molecular weights indicate larger amounts of 1,4 addition in low molecular weight fractions. Modifier concentration and extent of conversion are without effect on the proportion of 1,2 and 1,4 polymerizations. A. Saffer and B. L. Johnson, Firestone Tire & Rubber Co., Akron, O.

Effects of Side Vinyl Groups and Other Structural Features upon Physical Properties of Diene Polymers. Considerable information is now available about the detailed molecular structure of natural rubber, gutta percha, and synthetic rubber-like polymers. This paper attempts to evaluate such data, particularly concerning the relative amounts of 1,4- and 1,2-addition content, of isoprene and butadiene polymers and copolymers with styrene prepared by different methods of polymerization as determined by infra-red absorption, perbenzoic acid oxidation, specific refraction and iodine number. The study of isoprene polymers is of particular value because of the naturally available "controls," natural rubber and gutta percha, and their much greater chemical reactivity toward certain reagents, such as hydrogen chloride and chromic acid, than butadiene polymers.

The second purpose of this paper is to correlate the structural features as deduced from the above data with certain properties of their corresponding tread stock vulcanizates, such as tensile strength, rebound value, and brittle point.

A study of the structures of natural rubber and three synthetic polyisoprenes made by emulsion, a special organo-metallic catalyst and sodium showed decreasing amounts of 1,4-addition content in the order listed. A similar comparison with synthetic polybutadienes made by emulsion, a special organo-metallic catalyst and potassium (Buna 85) showed decreasing amounts of 1,4-addition content in the order listed. Finally, butadiene/styrene 75/25 copolymers made by emulsion (GR-S), a special organo-metallic catalyst and sodium also showed decreasing amounts of 1,4-addition content in the order listed.

Correlation of structure inferred from the above data with physical properties of corresponding tread stock vulcanizates indicates that with decreasing amount of 1,4-addition content the brittle point rises, the rebound value decreases, and the tensile strength increases. The polymers made with the special organo-metallic catalysts are better than would be predicted, probably because of higher molecular weight. Natural rubber occupies a unique position because it is substantially a linear high polymer with all the double bonds in the *cis*-position. J. D. D'Ianni, Goodyear.

A Study of Reaction of Buna Rubbers with Aliphatic Mercaptans. The results obtained from studies of the reaction of emulsion polymers of butadiene, isoprene and copolymers of butadiene with various aliphatic mercaptans are summarized. The reaction of ethyl mercaptan with several emulsion polymers in latex form is described, and the variables influencing the degree of polymer double double bond saturation by mercaptans are discussed.

Data are presented for the double-bond saturation values obtained for several types of polymers and copolymers of butadiene which were reacted in mass with high molecular weight aliphatic mercaptans. The influence of the copolymer composition upon the proportion of double bonds which react with mercaptans is discussed. The presence of several types of mercaptan reactive ethylenic structures in emulsion polymers of butadiene are indicated.

About 42% of the unsaturation of a GR-S-type polymer is consumed by reaction with highly active mercaptans in solution at ordinary temperatures. The selectivity of the reaction is considered, and possible structures of the mercaptan reactive double bonds are suggested. G. E. Serniuk, F. W. Banes, M. W. Swaney, Standard Oil Development Co., Elizabeth, N. J.

The Vulcanization of Rubber with Sulfur. I. Williams, J. M. Huber, Inc., Borger, Tex.

Studies on Vulcanization: Mechanism and Theory. X-ray and stress-strain data have been obtained which indicate that accelerators and divalent metallic compounds, as well as sulfur, react with the rubber molecules during vulcanization and become a part of the rubber vulcanizate. The vulcanization reaction was found to behave like a normal chemical reaction in solution, which is influenced by the temperature, solubilities of the reacting ingredients, relative strengths and concentrations of the acids present and pH.

On the basis of these results and the known characteristics of vulcanized rubber, a theory is advanced for the vulcanization reaction which supports the original hypothesis of Charles Goodyear and the more recent conclusions of Midgely, Henne, and Shepard. According to this theory, vulcanization is a process by which the intermolecular forces are increased by the introduction of polar groups, generally acidic in nature, into the rubber molecules. This is accomplished by the addition of certain types of oxidizing agents to the alpha methylene carbon atoms or double bonds. These intermolecular forces are further increased with soluble divalent metallic compounds through the formation of ionic valences between the divalent metallic ions and the polar acidic groups of the rubber vulcanizates. These divalent metallic ions may bridge the rubber molecules through the ionic valences in the form of a salt.

The intermolecular forces established during vulcanization give a rigidity to the molecular structure, which retards plastic flow and crystallization of the rubber molecules. They also are responsible for the other characteristics of vulcanized rubber. The molecules in vulcanized rubber are presumably not joined by primary valence bonds through sulfur or oxygen bridges, but retain their individual existence. R. D. Stiehler[1], and J. H. Wakelin[2], B. F. Goodrich Co., Akron.

The Synthesis of Esters of Azodicarboxylic Acid and Their Relations with Rubber. Esters of azodicarboxylic acid readily undergo addition reactions with various unsaturated compounds possessing labile hydrogen atoms. In the present investigation the reactions of ethyl azodicarboxylate with natural rubber, neoprene, balata, and polybutadiene have been studied in some detail. Addition proceeds in benzene solution even at room temperature, the reaction with *Hevea* is substantially complete after about 50 hours. Adducts containing approximately one mole of combined azo ester per C_5H_8 unit can be prepared.

To elucidate the structures of these rubber and synthetic rubber derivatives, the adduct formed with 2-methyl-2-butene and ethyl azodicarboxylate was split with ozone.

$$\underset{\displaystyle\overset{|}{CH_3}}{CH_3C}{=}CH{-}CH_3 + C_2H_5O_2CN{=}N{-}CO_2C_2H_5 \longrightarrow CH_2C{=}CH{-}CH_3\ (\text{with } CH_3 \text{ on C, and } N{-}CO_2C_2H_5 \text{ / } HNCO_2C_2H_5 \text{ on } CH_2)$$

$$\begin{matrix} CH_3C=O \\ | \\ CH_2-N-CO_2C_2H_5 \\ | \\ NH-CO_2C_2H_5 \end{matrix} + CH_3CHO \xleftarrow{O_3} \begin{matrix} CH_2C=CH-CH_3 \\ |\quad | \\ |\quad CH_3 \\ N-CO_2C_2H_5 \\ | \\ HNCO_2C_2H_5 \end{matrix}$$

Isolation of acetaldehyde confirms the predicted addition at an alphamethylenic carbon atom.

A series of analogous dis-azo esters has been prepared as follows:

$$HOROH + COCl_2 \longrightarrow ClCOOROCOCl$$

$$H_2NNH_2 + (R'CO)_2O \longrightarrow H_2NNHCO_2R' + R'OH$$

$$2H_2NNHCO_2R' + ClCO_2RCO_2Cl \xrightarrow{2R''_3N} [R''CO_2NHNHCO_2]_2{-}R{-} + 2R''_3N.HCl$$

$$[R'CO_2NHNHCO_2]_2{-}R{-} \xrightarrow{[O]} [R'CO_2N{=}NCO_2]_2{-}R{-}$$

[1] Present address, National Bureau of Standards, Washington, D. C.

[2] Present address, Office of Research and Inventions, Navy Department, Washington, D. C.

These dis-azo esters also react readily with rubber; the reaction is accompanied by vulcanization owing to cross-linking of the chains. The dis-azo esters represent, therefore, a new class of non-sulfur vulcanizing agents. Only small proportions of the dis-azo esters are necessary; no other compounding ingredients are required, and the vulcanization is exceptionally rapid. Films prepared from benzene solutions containing from two to five parts of the curing agent per 100 parts of rubber are fully cured after drying at 50 to 60° C. Tensile strengths are around 3,000 pounds per square inch. N. Rabjohn and P. J. Flory, Goodyear.

Vulcanization of GR-S with Halogen Compounds. An entirely new class of non-sulfur vulcanizing agents for butadiene-styrene copolymer rubbers has been discovered. This consists of halogenated compounds which may be divided into three types: (1) halogenated aliphatic hydrocarbons containing at least one $—CX_3$ group, where X represents chlorine, bromine, or iodine, (2) halogenated aryl methyl compounds containing a least one halogen in the methyl group, and (3) aliphatic compounds containing a $—CX_2$ group and another reactive group, such as ethyl trichloroacetate. Each of these types behaves somewhat differently with respect to activation by metal oxides and other substances, but all will give vulcanizates having high moduli and good tensiles. The vulcanizing agents of the second type are of particular interest since by their use vulcanizates of unusual aging properties can be produced. These vulcanizates show no increase in moduli or decrease in elongations on 1-2 day 100° C. oven aging and sometimes even show reversion on aging, a very unusual phenomenon for GR-S.

The mechanism of vulcanization of these halogenated vulcanizing agents will be discussed in the light of modern theories of vulcanization. The may lead to new concepts of the vulcanization process. B. M. Sturgis, A. A. Baum, and J. H. Trepagnier, E. I. du Pont de Nemours & Co., Inc., Wilmington, Del.

Thursday Afternoon—September 12

Polymeric Unsaturation and the Relative Rate of Cross Linkage. In the conventional vulcanization reactions with sulfur and accelerator, the rate as well as the extent of cross-linking to form polymer networks is dependent upon the concentration of chemical unsaturation. On the basis of possible paths of cross-linkage between adjacent molecular chains (in random motion), a theoretical concept between the time of reaction, to a given concentration of cross-links, and the molar unsaturation of the polymer is developed. This theoretical concept leads to the hypothesis that the time, t, required to obtain a given state of cure (i.e., concentration of cross-links) should be proportional to the reciprocal of the square of the molar unsaturation, n. Thus the equation $t = c/n^2$ is proposed.

Experimental evidence closely approaches the proposed hypothesis with a system composed of polymer, zinc oxide, sulfur, and tetramethyl thiuram disulfide. The equation, based upon experimental data, was found to be $t = c/n^{1.9}$ when precautions and corrections were applied. To insure constancy of molecular weight, polymers of varying degree of unsaturation were fractionated, and similar molecular weight ranges were used throughout. The polymeric unsaturation was defined by molar unsaturation per 1,000 monomer units determined by ozonolysis; the unsaturation of the experimental polymers ranged from 3 to 22 on this basis. The course of the cross-linking reaction was followed by volume swell measurements converted to relative cross-links by the Flory-Rehner relation[3] which was experimentally confirmed by showing that extension modulus and calculated relative cross-links were directly related. R. L. Zapp, Standard Oil Development.

Relationship between Gel Content, Plasticity, and Dilute Solution Viscosity of Elastomers. Three important properties of elastomers—gel content, plasticity, and dilute solution viscosity—have been found to be interrelated. The relationships between these variables are apparently not dependent upon the nature and ratio of co-monomers or upon the nature and amounts of the other ingredients in the polymerization recipes; furthermore, the relationships hold for standard GR-S as well as for all types of experimental polymers.

The three properties dealt with are measured as follows. Gel content is the proportion of insoluble material remaining upon extraction of an elastomer in benzene (care is taken to avoid mechanical agitation of the extraction system). Plasticity is measured by means of the Mooney (shearing-disk-type) plastometer. The viscosity measured by means of an Ostwald pipette viscometer on a dilute solution of the sol portion of an elastomer is termed the "dilute solution viscosity."

For gel-free polymers the relationship between the dilute solution viscosity (DSV, centipoises) and the plasticity (M, Mooney plastometer units) is expressed by means of the equation:

$$DSV = 0.0158\ M + 1.315 \quad (1).$$

The correlation coefficient between these two variables is + 0.772 (based on 149 sets of data).

An index "I" was calculated from the data obtained on polymers containing gel; this index is defined as the ratio

$$I = DSV_0/DSV$$

where DSV_0 represents the observed dilute solution viscosity, and DSVc represents the calculated dilute solution viscosity, based on the zero-gel-content equation (1). A plot of this against gel content shows a linear relationship; the correlation coefficient between the index "I" and the gel content is —9.32 (based on 49 sets of data). This linear relationship between the index "I" and the gel content yields the following expression for the relationship between gel content (G, per cent.), Mooney plasticity (M, Mooney plastometer units), and dilute solution viscosity (DSV, centipoises):

$$DSV = (0.0158\ M + 1.315)(1.072 - 0.0120\ G), \quad (2)$$

where the gel content (G) is greater than 1%. The range 0 to 1% seems to be a transition range; equation (1), based on data obtained on gel-free polymers, serves to calculate the dilute solution viscosity in this range.

The ratio, DSV_0/DSV_c, might serve as a useful index of molecular structure; a ratio of less than unity, appears to indicate a structure of relatively low average-molecular-weight; whereas a ratio of higher than unity seems to indicate a relatively higher average-molecular-weight structure. A. L. Back, National Synthetic Rubber Corp., Louisville, Ky.

[3] *J. Chem. Phys.*, 11, 521 (1943).

Comparison of the Effects of Oven and Bomb Aging at Corresponding Temperatures. Attempts to correlate oxygen bomb and air oven aging generally prove unsatisfactory, particularly with GR-S, when each test is run at the usual temperature. In fact, a direct correlation should not be expected under these conditions with a simultaneous change in temperature and oxygen concentration. A separate evaluation of the effect of temperature and of oxygen concentration has been accomplished by comparing the results of both oven and bomb aging at each of two temperatures: namely, 80 and 100° C. The results may be summarized as follows:

1. Increased temperature increases the rate of deterioration in both types of aging, but the effect appears to be more marked in the oxygen bomb.

2. The reaction of oxygen with GR-S which results in hardening (cross-linking) appears virtually independent of oxygen concentration above that in air and is the predominant reaction in the air oven.

3. The reaction of oxygen with GR-S which leads to chain scission is increased by oxygen concentration and is the predominant reaction in the oxygen bomb.

4. Chain scission is reflected in both tensile breakdown and in a lower modulus than would otherwise be obtained since the shortening of the chains would have a softening effect. This accounts for the smaller modulus increase observed with bomb aging and for the reversion of the modulus observed at 100° C. J. R. Shelton and H. Winn, Case School of Applied Science, Cleveland, O. (Work done as a part of the Firestone company research fellowship.)

Exposure Cracking of Rubber. Exposure cracking of stretched rubber, thought to be the result of attack by ozone, is studied by means of indoor and outdoor tests. A machine has been constructed for repeatedly stretching test pieces in sunlight. Good correlation is shown between (a) static sun exposure and (c) an ozone exposure of samples preconditioned to favor continuous wax films. Good correlation is also shown between (b) dynamic sun exposure which should tend to break wax films and (d) an ozone expsure of samples from which wax films have been removed. Wax is thought to play a dual role in which it protects by forming a surface film, but at the same time makes the compound more vulnerable to ozone once a film is broken. J. H. Fielding, Goodyear.

Compression Set as a Relative Measure of State of Cure. One of the paramount problems confronting the rubber technologist today is the development of a quantitative method for measuring the state of cure. Many properties, such as tensile, T-50, free sulfur, etc., have been proposed; however most of these have been proved to be better measurements of the rate of cure within a limited system than of the state of cure.

The simplest definition of vulcanization given in the literature describes vulcanization to produce soft rubber as any treatment which maintains the elasticity of the rubber while decreasing its plasticity. Accordingly it

was felt that a measurement of the set acquiring characteristics of a vulcanizate should quantitatively indicate state of cure. The data in this report indicate that permanent set determined under a static constant compression condition may be used advantageously as a relative measure of the state of cure. This investigation was performed using a slight modification of method B of the A.S.T.M. standard D 395-40 T, Compression Set of Vulcanized Rubber. For purposes of comparison, T-50 values, combined sulfur values, and permanent sets, as determined under a dynamic constant compression condition, are also included.

Data are presented which show the changes in physical properties of natural rubber vulcanizates when the sulfur and accelerator levels are varied in an independent and systematic manner. Contrary to popular thought, the results indicate that compounds containing one part of sulfur will reach a higher state of cure, as indicated by compression set, than compounds containing three parts of sulfur per 100 parts of rubber when comparable accelerations are used.

Data are also given for GR-S and GR-I systems which indicate the validity of a compression set test as a measure of state of cure. L. R. Sperberg, L. A. Bliss, J. F. Svetlik, Phillips Petroleum Co., Phillips, Tex.

Friday Morning—September 13

The Adsorption of Stearic Acid by Carbon Blacks. It is generally believed that stearic acid aids the dispersion of channel black in rubber by acting as a wetting agent. Furthermore it is recognized that rubber stocks loaded with channel black require an increased amount of stearic acid for proper cure. Both of these phenomena are usually explained by stating that the black adsorbs stearic acid. The purpose of this work was to determine the adsorption isotherms for stearic acid on channel black and other rubber blacks using heptane as the solvent.

It was found that channel black adsorbs approximately 0.8-part stearic acid per 50 parts black at saturation. It was further found that surface area is not the only factor determining the degree of adsorption. The surface condition, as exemplified by the pH determined according to Wiegand, is also important. For example, a conducting furnace black with a larger particle size and a higher pH than channel black adsorbs considerably more stearic acid than the latter black. R. E. Morris and J. W. Hollister, U. S. Naval Rubber Laboratory, Mare Island, Calif.

Plasticizer-Filler Mixtures and Their Dispersion in Rubber. Conventional methods of incorporating plasticizers and pigments into rubber mixtures have many shortcomings inherent in the method of separate incorporation of these two ingredients. The investigation reported in this paper deals with a method of simultaneous incorporation of pigments and plasticizers in the form of premixed preparations. It has been found that the ratio of pigment to plasticizer of such premixed preparations is the deciding factor in the usefulness of the mixtures. A fixed ratio of pigment to plasticizer exists for each filler. The relation between plasticity and this ratio has been investigated, and the experimental data are presented in tables and graphs. Tests were conducted along the following lines:

(1) Plasticity measurements on a series of GR-S compounds with gradually increasing amounts of plasticizers;

(2) Plasticity measurements on a series of GR-S compounds with gradually increasing amounts of fillers;

(3) Preparation of plasticizer-filler mixtures containing the two ingredients in various proportions;

(4) Measurements of plasticity and physical properties of GR-S compounds containing the preparations (3) in comparison with separate incorporation of the components of the preparation;

(5) Testing the results obtained with GR-S as to their applicability to other rubbers.

It has been found with most pigments that the ratio of pigment to plasticizer in a premixed preparation should be such that the addition of the mixture to the masticated rubber should not increase its plasticity over the plasticity of the masticated rubber itself. Examples are given for this general rule and for exceptions from the rule. F. S. Rostler, University of Delaware, Newark, Del., and H. I. du Pont, Wilmington Chemical Corp., Wilmington.

GR-S-10 Compared with GR-S in Vulcanizates Containing Various Fillers. This investigation has shown that substitution of GR-S-10 (butadiene-styrene copolymerized in the presence of a soap of a special disproportionated rosin) for GR-S in a test vulcanizate containing, as a filler, a representative hydrated alumina, calcium silicate, precipitated calcium carbonate, zinc oxide, or fine thermal black, brought about a substantial increase in tensile and tear strengths, and ultimate elongation. Except in stocks containing calcium silicate GR-S-10 gave, in general, somewhat lower modulus and hardness than GR-S. While the tensile properties of the unsoftened compositions based on both polymers were somewhat lower than those compositions containing either hydrogenated rosin or a coumarone-indene resin, the difference between GR-S-10 and GR-S was even more outstanding.

On air-oven aging and, in most instances, after boiling water treatment, GR-S-10 maintained its advantage over GR-S.

Increased sulfur in a hydrated alumina-filled GR-S-10 composition indicated that hardness and modulus values of compositions containing the "rosin rubber" can be raised to those of the corresponding GR-S stock with only an insignificant loss of its advantage in terms of tensile properties.

The various pigments could be incorporated at a considerably increased rate during milling when GR-S-10 was used, apparently because of both more rapid dispersion of the pigments into the rubber and reduced tendency of the fillers to work through the band. Building tack of the milled sheets of GR-S-10 compound was materially better than those based on GR-S. L. O. Amberg, Hercules.

An Improved Method of Compounding Pure Gum GR-S Stocks. Pure gum GR-S stocks with only sulfur and inorganic oxides showed fairly good cures with magnesia, litharge, and lime with tensile strength of 400-500 p.s.i., but practically no cure with zinc oxide. However in all cases the addition of inorganic oxidizing agents, red lead, lead dioxide, lead chromate, and ferric oxide, accelerated the cure and generally increased the tensile strengths. Also, the further addition of certain softening agents, especially Turgum, increased the tensile strengths considerably. The aging of these stocks, particularly those containing magnesia, generally showed an additional increase in tensile strength without an undue lowering of the elongation.

The most interesting compounding was obtained with magnesia, red lead, or ferric oxide, and Turgum. Some of the compounds may be considered just outside of pure gum types, but are near enough to be included. An early blend of GR-S for comparative compounding was used. Later improved GR-S should give even better results.

Two parts sulfur, 10 magnesia, 60 minutes at 292° F., gave tensile strength of 495 psi. and elongation of 725%; addition of 5 red lead increased this to 715 psi. and 675%, and further addition of 10 Turgum, in 90 minutes, gave 835 psi. and 1030%, which after aging (48 hours at 212° F.) became 1090 psi. and 890%. Four sulfur, 20 magnesia, and 15 ferric oxide in 60 minutes gave 1120 psi. and 500%, and added 10 Turgum gave 1500 psi. and 670%, which after aging became 1750 psi. and 540%. H. L. Fisher, U. S. Industrial Chemicals, Inc., and A. R. Davis, American Cyanamid Co., both of Stamford, Conn.

Lignin for Reinforcing Rubber. Lignin, as made from the waste black liquor of the sulfate wood pulp process, is an effective reinforcing agent for synthetic or natural rubber when incorporated into latex by the coprecipitation or masterbatching procedure. GR-S so reinforced with 38.5 volumes of lignin yields vulcanizates having a tensile strength of 2900 psi. and a tear resistance of 380 pounds per inch, values exceeded only with channel black. With 77 volumes loading, the tensile strength of 2800 psi. and tear resistance of 550 pounds per inch are higher than those for any other pigment tested. In abrasion resistance lignin vulcanizates are between carbon blacks and the common inorganic fillers. Shore hardness values are close to those for channel black.

Lignin reinforced rubbers weigh appreciably less per unit volume owing to the low specific gravity, 1.3, of lignin. The brown color of lignin permits a wide color range, without sacrifice of mechanical properties, by blending with white pigments. Lignin coprecipitates require only a brief milling time for complete mastication.

Details of the preferred procedure for preparing masterbatches of lignin and GR-S are given. Other suggested incorporation procedures made possible by the colloidal properties of lignin are reviewed. J. J. Keilen and A. Pollak, West Virginia Pulp & Paper Co., Charleston, S. C.

Effect of Fungicides on Rubber. I. Introduction. Army operations in tropical areas necessitate protection of equipment, particularly cotton fabrics, against fungus attack. A research program to study the effect of fungicides on the physical properties of natural and synthetic rubber, when the fungicide is incorporated as a component part of the compound, and to what extent natural and synthetic rubber coatings are affected, when in contact with various fungicides, is being conducted at the Engineer Board.

II. Status of the Work. The work is in the preliminary stages at present,

covering one concentration of five fungicides incorporated into three types of rubber. It will be expanded to include two other concentrations, other fungicides, and combinations of fungicides on all types of natural and synthetic rubber.

III. Materials.

a. The types of rubber tested to date
   1. Natural rubber (smoked sheet)
   2. GR-S standard (Buna S)
   3. GR-M (Neoprene Type GN-A)

b. The types of fungicides tested to date
   1. Copper naphthenate
   2. Pyridyl mercuric stearate
   3. Salicylanilide
   4. Pentachlorophenol
   5. Di-hydroxy-di-chloro-diphenyl methane.

IV. Results. The results to date indicate that natural rubber and neoprene require no protection for the rubber itself, although a fungicidal treatment for GR-S may be desirable. None of the fungicides tested had any pronounced injurious effect on natural rubber or neoprene. All fungicides tested, except copper naphthenate, were satisfactory for use with GR-S. The copper naphthenate had a marked effect on retarding the rate of cure and decreasing the strength of GR-S. J. L. Stief and J. J. Boyle, The Engineer Board, U. S. Army, Fort Belvoir, Va.

The Effect of Iron on the Aging of GR-S. It has been found that small amounts of iron accelerate the deterioration of salt acid or alum (aluminum sulfate) coagulated GR-S at elevated temperatures (90-120° C.). However alum coagulated GR-S, even in the presence of traces of iron, is superior to salt acid GR-S from the standpoint of aging and oxygen absorption. The aging of an alum coagulated polymer can be improved appreciably by the use of low iron aluminum sulfate. Coagulation of GR-S with mixtures of ferric sulfate and aluminum sulfate showed that decreasing the ferric sulfate content of the mixture improved the resistance of the polymer to deterioration on aging.

With the better antioxidants for GR-S, the effect of iron is minimized, and more drastic heat aging is required to demonstrate the advantage of using low iron aluminum sulfate. The effect of iron as a polymer contaminant was found greater than that of copper or manganese.

For a tread-type vulcanizate, the improvement in aging obtained by decreasing the iron in the polymer coagulant is not very pronounced. In studies using mixtures of ferric sulfate and aluminum sulfate to coagulate the polymer samples, relatively high iron concentrations were required to produce a noticeable effect on vulcanizate aging.

Oxygen absorption studies are in general agreement with the above results. Decreasing the amount of iron in the polymer appreciably decreased the oxygen absorption of the polymer and had a smaller but similar effect on the oxygen absorption of a tread-type vulcanizate. H. E. Albert and G. W. Gottschalk, Firestone.

Butyl Inner Tubes—Growth in Service. The growth of Butyl tubes in service is being studied in road tests run at San Antonio, Tex., on standard test cars.

Data are presented relating growth to the amount and type of black and softener used, to the use of polyisobutylene (Vistanex) as a process aid in Butyl tube stocks, and to the Polyac technique for strengthening the green tube. The results of these studies demonstrate that compounding changes exert considerable influence on growth.

Basically, however, growth depends on the type of Butyl used. Test results are presented demonstrating the lower growth resulting from the use of "fast curing" (high modulus) Butyl.

Under the conditions of test the actual growth in service of a well-compounded, well-cured Butyl passenger-car tube of standard design made from high modulus Butyl is approximately 15% less than the growth obtained using a natural rubber tube of the best quality. L. S. Verde and R. H. Dudley, Standard Oil Co. of New Jersey, New York, N. Y., and L. B. Turner, Standard Oil Development Co.

The Composition and Properties of Silastic. Silastic, a silicone elastomer, has in common with the other silicones a skeleton composed of alternate silicon and oxygen atoms with organic side groups also attached to the silicon atoms. Variations in the chain length, the degree of cross-linkage, and the type of substituent groups produce elastomers having different properties. Further variations in properties can be produced by changing such factors as type of filler and rate and degree of cure.

Studies have been conducted on the effect of various inorganic fillers on such properties of the cured rubber as tensile strength, % elongation, stability at elevated temperatures, % compression set, water absorption, and electrical behavior. In addition silicone rubbers of different composition have been evaluated for resistance to deterioration by ozone, heat, oxygen, oil, and various chemical reagents. The results of these tests have indicated the use of these silicone elastomers for certain specific applications which require thermal stability, chemical resistance, and resistance to aging. P. C. Servais, Dow Corning Corp., Midland, Mich.

Friday Afternoon—September 13

Behavior of Rayon Tire Cord during Latex Dipping. Rayon cannot be built into tires until it has first been treated with an adhesive so that it will bond satisfactorily to rubber; this differs from cotton where adhesive treatments are optional. This investigation was conducted to supply information for controlling factory dipping operations as no literature is available on this subject.

A study of the behavior of rayon tire cord during dipping reveals a number of differences in the behavior of rayon and cotton, as well as differences between rayons of varying manufacture.

Adhesion of rayon to rubber was found to be a function of solids pickup. In turn, solids pickup depends on the wetting out characteristics of the rayon, the various properties of the latex bath, and the manner of operating the dipping machine. These variables are described in detail, their relative importance pointed out, and the manner of their control indicated. Of special interest is the increase in concentration of the dipping bath caused by rayon; the actual magnitude depends on the finishing agent used by the manufacturer. Unless this increase is controlled, a variation in solids pickup will occur which in turn affects adhesion, square yard weight to the calender, drying rate, and cost.

A logical theory is developed to explain the differences between cotton and rayon as well as the various rayon grades. H. H. Gillman and R. Thoman, Gates Rubber Co., Denver, Colo.

Sheet Production by Continuous Coagulation of *Hevea* Latex. When fresh *Hevea* latex is acidified to pH 4.5 to 4.9, as in standard estate practice, the latex does not clot or coagulate at once. Instead the rubber particles flocculate, and the mix, though thickened, remains fluid for upward of three-quarters to one hour, after which the rubber particles begin to coalesce into a coagulum. After further standing, usually overnight in Malayan practice, the coagulum acquires sufficient strength to withstand handling without undue deformation when it is machined into sheet. For handling small volumes of latex daily, this process has seemed adequate. But for working up the output of large estates, or for use in central factories, a continuous coagulation process would appear to offer advantages. Such a process, taken through the laboratory stage, is described in this paper.

By the use of coalescence accelerators the time required for coagulum formation cannot only be controlled; it can be reduced to one minute or so, or even be eliminated altogether in the case of the most active agents. Representative of this type of materials are the straight-chain saturated fatty acids, especially those of 10 to 14 carbon atoms, certain phenols, and some of the higher fatty alcohols. The former, as soluble salts, are added to fresh latex, which is then fed continuously together with a stream of coagulant on to a properly shaped conveyer belt discharging the coagulum continuously into a sheeting battery. Machined wet sheet can be produced within three minutes or so after acidification of treated latex. E. B. Newton and E. A. Willson, B. F. Goodrich Co., Akron, and W. D. Stewart, B. F. Goodrich Co., Boyce - Thompson Institute, Yonkers, N. Y. (Laboratory where reported work was done: Malayan Research Laboratories, The B. F. Goodrich Co., Kuala Lumpur, Selangor, Federated Malay States.)

Low-Temperature Characteristics of Elastomers. The low-temperature stiffening of elastomers frequently limits their usefulness. A new laboratory test for measuring their stiffness at low temperatures is described. Strips of the stocks to be tested are mounted around a cylindrical rack in a vertical, cylindrical insulated chamber. The temperature in the chamber is controlled by cooling the base externally with dry ice and by a very moderate regulated flow of precooled air through dry ice in the bottom of the chamber. This system gives very stable temperatures which are easily controlled.

The chamber can be rotated to attach the samples in succession, by means of projecting top grips, to a suitably mounted torsion wire. The stiffness is measured by the angle of twist of the sample when the torsion head is rotated 90 degrees. The relative modulus for any temperature is calculated as the ratio of the modulus at this temperature to that at room temperature. Plots of angle of twist *vs.* temperature show

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a rather sharp break at the low-temperature end of the curve. This determines a somewhat subjective "freezing point."

Curves are given to illustrate the wide variety of low-temperature stiffening characteristics for elastomers. The chemical composition of the monomers is the dominating factor for these properties for various synthetic rubbers.

The stiffness of elastomers capable of crystallization as *Hevea*, neoprene, and Butyl, depends not only on the temperature, but upon the time of exposure as well. To study these effects the foregoing apparatus was used in a cold room. A rather long induction period may occur during which the stiffness is essentially constant. It then increases and eventually reaches a larger constant value. Several months may be required to complete these changes. GR-S on the other hand, did not show any progressive stiffening over a period of 2½ months at -20° F.

Reduction in the speed of retraction at low temperatures is a more critical measure of the impairment of high elasticity than the stiffness as observed for slow deformations. Some results of measurements of speed of retraction at reduced temperatures are included to illustrate this point. D. E. Woodford, C. S. Wilkinson, Jr., and S. D. Gehman, Goodyear.

The Effect of Gaseous Environment on the Dielectric Strength of Synthetic and Natural Rubber Compounds. An investigation of some factors influencing the dielectric strength of synthetic and natural rubbers was made.

It is known that at normal temperatures failure occurs by disruptive breakdown. At higher temperatures dielectric absorption is increased, and failure usually is the result of thermal breakdown. Moisture and impurities also have deleterious effects. Under high-voltage conditions the presence of corona and attendent ozone may promote rapid failure by degradation of the material. Failure due to corona action is particularly rapid when the rubber is in a stretched condition.

The purpose of this paper is to demonstrate the effect of gaseous environment on dielectric strength and, more specifically, to evaluate the role of oxygen as a fundamental factor in dielectric failure.

Representative stocks of acrylonitrile, Butyl, chloroprene, polysiloxane, and polystyrene-base polymers, as well as natural rubber, were tested in air and atmospheres of carbon dioxide and nitrogen. Similar tests were run *in vacuo*. The specimens used in these tests, initially .030-inch thick at the point of electrode contact, were stretched in two dimensions 25, 50 and 75% to obtain a comparative estimate of the extent of degradation caused by corona action as well as to observe any inherent effect that stretching in itself might produce. Test temperatures employed ranged from -50 to 200° C.

Experimental data are presented and interpreted. C. M. Doede and A. Pfenninger, Jr., Connecticut Hard Rubber Co., New Haven, Conn.

New Techniques with a Compression Plastometer. The information about rheological properties that is commonly obtained with a compression plastometer can be supplemented if a few additional readings and calculations are made. It is customary to use the height of the sample after a standard compression as a measure of plasticity or viscosity. However if several readings are taken during the same compression after varying periods of time, these may be used to give a quantity, K, the slope of the log rate of compression—log height of sample curve. It can be shown that K is related in an undefined manner to the degree of non-Newtonian behavior or to n in the expression:

$$\text{rate of shear} \sim \text{stress}^n$$

This is supported by the theoretical calculations published by J. R. Scott.

Also described is an attachment for a beam-type compression plastometer which permits the carrying out of recovery tests on samples subjected to compressions that are identical as to rate, period, and extent of compression.

Comparative data on plasticity, K values, thermoplasticity, rate of breakdown, solubility, and swelling index are presented for several natural and synthetic rubbers. These correlate for the natural rubbers to indicate which ones are closest to ideal liquids and which ones are the most cross-linked and heterogeneous. Results with synthetic rubbers correlate poorly, but show interesting trends. R. W. Planck, Industrial Tape Corp., New Brunswick, N. J., and L. D. Fallon, Mellon Institute of Industrial Research, Pittsburgh, Pa. (This work was carried out by the Tape Technology Fellowship, supported by the Industrial Tape Corp. and Johnson & Johnson, both of New Brunswick.)

Description of a Complete Osmotic Molecular Weight Apparatus. A detailed description of procedure and a complete apparatus, including osmometers and thermostat, are given for determining with reasonable speed the number average molecular weights of polymers.

The cylindrical glass thermostat (constant to ±0.005° C.) is mounted on a turntable which permits each osmometer to be brought into the best position for observation with the cathetometer. Twelve osmometers can be accommodated simultaneously in a bath of only 22 liters capacity, making for great compactness.

The apparatus is described in sufficient detail, including a sketch of the osmometer and a large photograph of the equipment in operation, that the unit can be built, if so desired.

Technique in the use of the osmometers for the determination of molecular weights is also reported. Regenerated cellulose film, conditioned in acetone-water mixtures, acetone, and finally toluene, produces membranes permeable to the solvent, but impermeable to the solute.

Preparation of samples (precipitation with 33⅓% methanol) to avoid the misleading effects of non-poylmer and very low molecular weight material is described.

To demonstrate the quality of data obtained with the method, results for a standard government specification GR-S and for samples of German Buna S-3 subjected to various treatments (untreated, heat-softened, and milled) are presented. The data include actual osmotic rises measured and plots of h *vs.* c and of $\frac{h}{c}$ *vs.* c for the several polymers. G. D. Sands and B. L. Johnson, Firestone.

Navy Specification Changes

TO KEEP the rubber industry currently advised of changes in and additions to pertinent Navy Department Specifications and Bureau of Ships Ad Interim Specifications, INDIA RUBBER WORLD will at regular intervals publish the title, number, and date of such new or amended specifications. Those members of the industry desiring copies of these specifications can obtain them upon request, giving title, number, and date, from the Navy Department, Bureau of Supplies and Accounts, Washington 25, D. C.

Five specification titles which have appeared since March 1, 1946, are listed below:

Navy Dept. Spec.	33T6a, Tips, Rubber (reclaimed) (for tables and benches), dated 1 March 1946.
Navy Dept. Spec.	33R11, Rubber, Synthetic, Gasket (for bolted steel tanks and gasket storage), dated 15 March 1946.
Navy Dept. Spec.	33H18c, Hose, Floater, Non-Metalic, dated 15 March 1946.
Navy Dept. Spec.	33R9, Rubber, Synthetic, Medium Soft; Molded, Sheet, and Strip (for airport, hatch, and water-tight door gaskets) dated 15 May 1946.
BuShips Spec.	15C1 (INT), Cables, Electric, Insulated, Shipboard Use; Amendment—5, dated 15 May 1946.

New Resin Emulsion

A NEW resin emulsion designed for use in the plasticizing of Buna N films and polyvinyl chloride latices has been announced by Resinous Products & Chemical Co., Philadelphia, Pa. Known as Emulsion G-25, it is an aqueous dispersion of Paraplex G-25 and is characterized by non-migration, permanence, resistance to heat and hot oil, and by low temperature flexibility. Combinations with this emulsion can be pigmented to give coated fabrics a variety of colors, with ease of application and absence of inflammable or expensive solvents greatly widening its applications in the plasticizing field.

Emulsion G-25 is a white, medium to low viscosity fluid with a solids content of 48-52%, a pH of 9.0-9.5, and an approximate weight of eight pounds to a gallon. The emulsifying agent used in its manufacture is of the non-ionic type, producing an emulsion with enhanced stability toward electrolytes and an increased ability to be blended safely with other emulsions containing anion or cation active dispersing agents.

One of the most important applications to date of the new emulsion is in polyvinyl chloride latices, such as Geon latex, in addition to its use as a modifying agent for other polymers. A typical formulation for plasticized polyvinyl chloride film employs 50 parts of Emulsion G-25 (50% solids) and 50 parts of Geon latex (Nos. 11X15 or 11X24, both with 50% solids). After five minutes drying at 80-85° C., films produced from this formulation, when heated for five minutes at 85-150° C., give physical properties approaching those obtained by milling an equivalent Paraplex-Geon stock. In the pigmenting of coated fabrics best results are obtained by preparing a paste of the pigment in water using Triton R-100, or similar dispersing agent. The dispersed pigment can then be readily compounded with the emulsion mixture.

Rubber Division, C.I.C., Holds First Meeting at Toronto

ATTENDANCE at the first meeting of the Rubber Division of the Chemical Institute of Canada, held at the Royal York Hotel, Toronto, Ont., June 25, varied between two and three hundred persons, with a significant percentage being American chemists. Norman S. Grace, of Dunlop Rubber Co., Ltd., chairman of the Division, presided and introduced the speakers. Dr. Grace in his opening remarks welcomed the large attendance of regular members of the Division and the representation of American and English rubber chemists.

Richardson on the Chemical Industry

W. S. Richardson, president of the B. F. Goodrich Chemical Co., Cleveland, O., was the speaker at the general luncheon of the Institute on June 25. Speaking on the subject of "Our Growing Chemical Industry," Mr. Richardson made special mention of the bringing into being of an industry during war time capable of producing approximately one million tons of synthetic rubber a year on the North American Continent. In this connection it was pointed out that the native laborer on the plantations producing natural rubber earns approximately 4¢ an hour. On the average plantation three quarters of one man hour are required for a pound of production, 1,680 man hours per long ton of production at a cost of $68.00. In the production of synthetic rubber the laboring man earns about $1 an hour—25 times as much as his brother, the native, in the Far East, but he produces 30 times as much rubber on the average in an hour as the native does.

To assure that this synthetic rubber development and other advances in science accrue to all the people and contribute to better standards of living, Mr. Richardson expressed the opinion that the greatest good for the greatest number can only be brought about within the atmosphere of a free economy. He then reviewed the value of our present patent system as the heart of the chemical industry and cautioned against making any drastic changes in this system.

The demand for trained chemists and chemical engineers for the chemical industry is far greater than the supply, and Mr. Richardson deplored the fact that during the war the authorities in the United States did not take full note of the need of continuing the education of men with a scientific bent of mind. This is what happens when politics and the military take control of the economy because their courses of action are generally dictated by expediency, he added. We, who are associated with the chemical industry, must do all we can to see that steps are taken which will broaden the base of available trained minds to carry forward the great work of the industry, concluded Mr. Richardson.

Division Business Meeting

At the business meeting of the Rubber Division, presided over by Chairman Grace, the question of enlarging the scope of the Division to embrace both the rubber and plastics industries was discussed. It was also mentioned that in 1947 the Rubber Division would probably not meet with the parent society since the site of the 1947 Conference of the Chemical Institute of Canada in western Canada is too far removed from the center of the rubber industry in the Dominion.

New officers of the Division, announced at the Toronto meeting are: chairman, G. R. Smye, Firestone Tire & Rubber Co., Ltd.; vice chairman, H. G. Deline, Dunlop Tire & Rubber Co., Ltd.; and secretary-treasurer, R. E. Hatsch, Polymer Corp., Ltd. Executive members in addition to the above are: A. B. Lewis, British Rubber Co. of Canada Ltd.; J. C. Howard, Kaufman Rubber Co., Ltd.; and E. R. Rowzee, Polymer Corp., Ltd.

N. S. Grace, Chairman, Rubber Division, C.I.C., Presiding at Technical Sessions [1]

Technical Sessions

The first speaker at the technical sessions of the Rubber Division was Mr. Rowzee, director of research and development for the Polymer Corp., at Sarnia Ont., who discussed "Synthetic Rubber Research in Canada." Dr. Rowzee devoted a considerable part of his paper to a review of synthetic rubber research in Germany and the United States. With regard to research in Germany, much of the discussion paralleled that reviewed in the April, 1946, INDIA RUBBER WORLD (page 74), where the main features of the latest report of the United States Department of Commerce, Office of the Publication Board, on German synthetic rubber research was presented. The principal basic research carried out in the United States, i.e., the study of new monomers, the study of locus of reaction, the study of modifiers, the study of catalysts, the study of organic analytical methods, the study of improved physical-chemical measurements, and the study of latex, was then covered briefly. Mention was also made of the fundamental research conducted in England by the British Rubber Producers' Association, and Dr. Rowzee then pointed out that during all this time and up to the Spring of 1944, Canada had no organized research program on synthetic rubber.

With the successful operation of the Canadian Government's synthetic rubber plant at Sarnia from September 1943 on, it was decided that if Polymer Corp. was to operate as a permanent industry, like other industries, it would require an efficient research organization. Through the Department of Munitions and Supply, the Canadian Government made available a substantial appropriation for the financing of a research program. This appropriation was placed in the hands of the National Research Council, and a working partnership was formed with the National Research Council and Polymer Corp. as principals. To direct the work and to act as a policy-making body, an Associate Committee on Synthetic Rubber Research of the National Research Council was constituted under the chairmanship of C. J. MacKenzie. The committee decided that much of the Canadian research work should be fundamental in character, and the universities undertook most of this type of research; while Polymer Corp. undertook the bulk of the applied research.

Active work began during the Summer of 1944, and in the late fall of the same year Polymer Corp. appointed a director of research to develop a research program involving well-defined points of attack aimed at improvement of quality, diversification of production, and reduction of cost; to provide suitable research facilities for the Sarnia group; to obtain and train personnel necessary to carry out this program; to coordinate research in Sarnia with that of the National Research Council and the universities; and eventually to act as chairman of the Associate Committee. The work during the past two years was described in some detail. All told, 125 men and women are engaged in the Canadian synthetic rubber research program which has an operating budget of $340,000 in addition to the capital expenditures which will be incurred in the creation of new laboratory facilities.

"The past two years have been spent in laying a foundation for an effective synthetic rubber research organization in Canada. We are now at the point where we feel that substantial progress can be made toward the achievement of our objectives," Dr. Rowzee concluded.

The second paper on the morning program was given by L. R. G. Treloar, of the British Rubber Producers' Research Association, who has very kindly provided us with a somewhat more detailed abstract of his talk than that which appeared in our June issue.

"Of the early theories of rubber elasticity which attempted to explain this phenomenon in terms of the specific structure of the natural rubber hydrocarbon, none were sufficiently well established to claim any general acceptance. Present-day ideas spring from the consideration of rubbers as a class, in which a basic similarity of molecular structure is evident throughout a rather wide diversity of detailed chemical constitution. The common structural feature in all rubbers is a long-chain molecule, in which neighboring groups of atoms are connected by single bonds about which relatively free rotations continually occur as a result of the thermal energy of the chain units. In absence of external restraints, such a long-chain molecule may be shown by purely statistical considerations to exist in a randomly kinked form, in which the average distance between its ends is only a small fraction of its fully extended length. The molecule exhibits elasticity by virtue of this tendency to take up the most probable form, corresponding to the state of highest entropy.

"For a material to show rubber-like behavior, it is not sufficient that it should be composed of long-chain molecules of this type. Other necessary conditions are (1) that the forces between molecules should be sufficiently small to permit free rotation of the chain elements, and (2) that the molecules should be joined together at certain points in order to pre-

[1] Photo through courtesy of *Canadian Chemistry & Process Industries*, 137 Wellington St., W. Toronto 1, Ont.

vent viscous flow. The second condition is normally satisfied by vulcanization. The first condition can be satisfied only over a limited range of temperature. At low temperatures, where the intermolecular forces predominate, all rubbers transform to the glass-hard state.

"Rubbers built upon a perfectly regular pattern tend to crystallize, particularly when stretched. This crystallization has a marked effect on tensile strength and other physical properties.

"The quantitative treatment of the elasticity of an ideal network of long-chain molecules by the methods of statistical thermodynamics leads to general stress-strain relations for rubber under any type of deformation. These relations have been approximately verified for natural rubber in elongation, compression, and shear. The theory thus promises to give a valuable lead in the development of a general theory of large deformations comparable in importance with the classical theory of small-deformation elasticity."

The next paper was presented by H. J. Osterhof, assistant director of research, Goodyear Tire & Rubber Co., Akron, O., and had for its title, "Rubber Derivatives and Plastic Films for Food Packaging." Dr. Osterhof in discussing rubber hydrochloride (Pliofilm) described the reaction for its preparation, methods of control of the reaction, and some of the properties of the resultant product. He then mentioned the difficulties encountered in trying to prepare rubber hydrochloride from GR-S and the solution of this problem by using instead synthetic polyisoprene. The rate of chlorination with natural rubber and with synthetic polyisoprene is about the same, it was said. A large portion of the remainder of this paper included a discussion on plastics and packaging similar to that found on page 395 of the December, 1945, issue of INDIA RUBBER WORLD, where a paper by R. P. Dinsmore, vice president in charge of research and development, Goodyear Tire & Rubber Co., was published.

The last paper of the morning session, by J. D. Heide, United States Rubber Co., Passaic, N. J., dealt with "Statistical Control in the Physical Testing of Rubber." *(See page 653.)*

The fifth paper on the program and the first paper of the afternoon session was by G. P. Bosomworth, Firestone Tire & Rubber Co., Akron, on "High-Frequency Heating in Rubber and Allied Industries." The first part was devoted to a review of developments in electronics which led to the use of high-frequency heating in the rubber industry and various other industries. After mentioning some of the current applications in industries other than rubber and before describing applications in rubber and plastics, the speaker stated that although there are certain inherent advantages in dielectric heating when the application is right, it is very easy to get fooled in this process if we do not analyze each application and check the economics. Each process should be checked against at least the following questions: (1) Can the preferred results be obtained otherwise at the same cost? (2) Does it save space or reduce equipment investment? (3) Is quality improved? (4) Can changes in the formulation produce the same result by present methods? (5) Will the labor handling charges due to the increased production eat up the savings in power and time of cure?

If these questions are answered satisfactorily, and the electrical properties of the material are suitable for dielectric heating, then we have some chance of the process working out satisfactorily and we will get the following advantages, according to Mr. Bosomworth: (1) instantaneous heating of the mass; (2) uniform product throughout the mass; (3) improvement in quality; (4) lower ambient temperatures in the work area; (5) shorter process time.

The report of V. Smithers on the improvement in physical characteristics of rubber stock, when preheated by high-frequency current, as published in the January issue of INDIA RUBBER WORLD, (page 505), was next reviewed, and then illustrations of the use of high-frequency current in connection with hard rubber wheels, large draft gear parts, wringer rolls, and foamed latex cushions and mattresses were described. The complete cure of a tire is a difficult proposition because of the different compounds together with the steel beads and fabric, it was stated. The real problem is the design of the mold itself, and molds have been made of resin and glass fiber and tires cured in them.

Some of the details of selection of the proper type of equipment and its maintenance were discussed by Mr. Bosomworth in concluding his paper.

In the next paper by E. W. Madge, Dunlop Rubber Co., Ltd., Birmingham, England, entitled "The Development of Latex Processes in Great Britain," developments of special technical interest and some of the more unusual wartime and postwar advances in latex technology in England were considered. Mr. Madge's remarks were concerned with processes associated with natural latex, process associated with emulsion polymers, and processes associated with artificial dispersions. A good part of this paper was concerned with the latex foam sponge process. Methods for evaluating synthetic and artificial latices were suggested. It is expected that this paper will be published in our September issue.

The paper by R. P. Kenney, of Goodrich Chemical, on the "Integration of the Plastics and Rubber Industries", will be found on page 682.

The last paper on the program was by E. D. Maher and T. L. Davies, of Polymer Corp., and had as its title, "The Effect of Varying Monomer Ratio and Conversion on GR-S Type Copolymers." The survey of the factors indicated in the title was undertaken in order to determine how standard GR-S might be altered to produce a better tire or general-purpose polymer and to find out what new polymers might be produced with special properties for specific applications, it was said. From the data reported in this paper together with other unpublished data (by both of these workers and also other investigators), the authors concluded that with copolymers of the GR-S type, the co-monomer content should be kept uniform through the entire polymer and the molecular weight distribution should be as narrow as possible. For use in tires, GR-S should be improved both by lowering the conversion and increasing the butadiene content of the polymer. High styrene polymers, in the neighborhood of 40% combined styrene, will probably find increasing use in mechanical goods where improved tensile, elongation, and flex crack resistance will be of value. These two types of polymers will probably account for more than 90% of the GR-S consumed although other special polymers for cement, etc., will undoubtedly be developed, it was stated in conclusion.

New Plasticizer

PARAPLEX G-40, a new plasticizer for compounding polyvinyl chloride and synthetic rubber stocks, has been developed by Resinous Products & Chemical Co., Philadelphia, Pa., as a further modification of Paraplex G-25. The new plasticizer is not subject to spue, migration, or extraction by aliphatic solvents, and, like Paraplex G-25, becomes an integral part of the stock. While both plasticizers have resistance to extreme heat, to oil, and to ultra-violet and weathering, combined with good low-temperature flexibility, Paraplex G-40 is said to show markedly improved solvent resistance, appreciably lighter color, lower viscosity at elevated temperatures, but slightly poorer low-temperature flexibility.

Of special interest for applications where the use of polymeric plasticizer is desirable, Paraplex G-40 is particularly recommended for compounding specialty stocks such as those used for coated fabrics, unsupported sheeting, electrical jackets, adhesives, and oil- and heat-resistant gasket stocks. Paraplex G-40 stocks show the following physical properties: plasticizer content, 38%; modulus at 100% elongation, 1700 psi.; tensile strength, 2600 psi.; weight loss by extraction with water after 10 days at room temperature, 0.13%; with Nujol oil, 0.10%; and with SR-6 after 10 days at room temperature, 1.5%; heat loss after two days at 85° C., 0.3%; heat stability at 150° C., 5 hours; flammability, 4.2% in 3.5 seconds; and bend brittle temperature, –35° C. Paraplex G-40 gives unique results with Vinylite, Geon, and Buna N stocks. The properties of non-extractability, very light color, and non-migratability are obtained with all polyvinyl chloride modification, and outstanding aromatic fuel resistance is obtained in Buna N compounds.

New Office of Technical Services

ESTABLISHMENT of an Office of Technical Services, headed by John C. Green, was announced by the United States Department of Commerce. The new Office consolidates the work of the Office of the Publication Board, Technical Industrial Intelligence Branch, National Inventors Council, and Production Research and Development Division. According to Mr. Green, who has served as executive secretary of the Publication Board and chief engineer of the National Inventors Council, the Office will continue the work of the consolidated units and launch a new program of technical aid to business and industry. The 1946-47 appropriation approved by Congress includes increased administrative funds for the new Office, as well as $1,500,000 for research and development.

The Office of Technical Services will consist of four major units: the Invention and Engineering Division, the Industrial Research and Development Division, the Library and Reports Division, and the Technical Industrial Intelligence Division. The last-named is responsible for investigation of German industry and the collection of German scientific and technical information. Mr. Green has left for England to attend an international conference on German patents and will also spend several days in Germany inspecting OTS activities there.

A.S.M.E. Rubber and Plastics Division Meeting

A MEETING of the Rubber and Plastics Division of the American Society of Mechanical Engineers was held at the Book-Cadillac Hotel, Detroit, Mich., June 19 and 20. One session on rubber was held on the afternoon of June 19, and one session on plastics was held the morning of June 20. James H. Booth, of Thompson Products, chairman of the Division, presided at the technical sessions and at the business meeting on June 20. The meeting of the Division was held as a part of the regular A.S.M.E. semi-annual meeting.

The Business Meeting

The business meeting was a joint session of the executive and general committees of the Rubber and Plastics Division. The project of the Division of compiling a list of problems, involving rubber, which are met by the mechanical engineer, was discussed, as was the similar project of compiling a list of problems involving plastics. Chairman Booth appointed two committees, whose duties will be to lay out a program of desired subjects for papers to be presented before the Division which would give the mechanical engineer the information he wants on rubber and plastics and to enlist authors to prepare such papers and present them in an orderly schedule. The personnel of these committees follows: *rubber*, D. H. Cornell, chairman; Philip H. Smith and F. Householder; *plastics*, F. W. Warner, chairman; Glenn W. Neely and James Bailey.

Chairman Booth also proposed the presentation to E. F. Riesing, former chairman of the Division, of a gavel of rubber and plastics, suitably engraved, in recognition of Mr. Riesing's contributions to the Rubber and Plastics Division. It was agreed that such action should be taken.

The Rubber Session

The first paper given before the session on rubber was entitled "Rubber Springs—Shear Loading—Part II" by J. F. Downie Smith, of United Shoe Machinery Corp., Beverly, Mass. This paper consisted largely of a mathematical treatment of the movements to be expected from a rubber spring loaded in shear for several different shapes of rubber. Dealt with were a shear slab with linearly varying height, a double shear sandwich with linearly varying height, cylindrical disk sandwiches and double cylindrical disk sandwiches with constant area of rubber. Torsional shear bushings are used extensively in practice, and equations had been developed by the author in his earlier paper published in 1939 to show the connection between torque and angle of deflection for two cases: one with constant length of rubber for large deflections, and the second for the coaxial tube of constant stress for both small and large deflections. Because occasionally large deflections of the torsional tube of constant length are not necessary, an equation has been developed for small deflections. An equation was also developed for a coaxial torsion bushing with length decreasing linearly with increase in radius.

The second and only other paper on rubber given at the session was "The Evaluation of Rubber and Rubber-Like Materials," by J. D. Morron, of United States Rubber Co., Detroit, Mich. This paper first discussed in a general way the compounding of rubber and then went on to show the stress-strain curves for natural rubber stocks from 30 to 80 Shore durometer. Data on water absorption of natural and synthetic rubber stocks, and the permeability of natural and Butyl rubber, were followed by information concerning abrasion resistance, compressibility, and resilience. A considerable portion of the paper had to do with the drift or creep of natural and synthetic rubbers and static and dynamic fatigue. Extensive data were provided on the effect of heat aging, and stress-strain curves for natural and synthetic rubbers at various temperatures were included. The paper concluded with a discussion of the use of rubber and synthetics for the elimination of vibration and a discussion of the adhesion of rubber to metal.

The Plastics Session

The first paper at the session on plastics, "Plastics Mold Release," was given by Earl E. Ziegler, Dow Chemical Co., Midland, Mich. A new test, developed for the evaluation of thermoplastics mold release, consisting of (1) compression molding the plastic to be tested around metallic test specimens and then (2) measuring the force necessary to pull the specimens out of the molded plastic, was described. The effects that mold surface finish, mold metal, draft angle, mold lubrication, molding conditions, and polymer addition agents have on mold release were discussed. The mold release abilities of polystyrene, cellulose acetate, ethyl cellulose, methyl methacrylate, and cellulose acetate butyrate were presented.

"Flexible Organic Adhesives As Structural Elements," by D. L. Loughborough and F. D. Snyder, of The B. F. Goodrich Co., Akron, O., was the next paper. Plastilock 500, a new organic adhesive suitable for use on metals, plastics, and other rigid materials was described. This cement forms a strong, thermally stable, chemically resistant bond between many different materials. There is some indication that the adhesion is best when the atomic spacing in the joined pieces is similar to that of the adhesive, according to these authors. Best results are obtained with metal crystal spacings of more than four Angstrom units. It was also stated that it is quite clear that the theory of adhesion is poorly understood and should furnish excellent material for fundamental research work of the highest type.

The final paper on the program was "Engineering Properties of Fabric Base Thermosetting Laminates," by R. K. Witt, John Hopkins University, Baltimore, Md. The data reported were collected as part of a project of the Technical Committee and the Technical Advisory Committee of the Laminated Products Section of the National Electrical Manufacturers Association. Tests on samples of NEMA Grade L and Grade C cotton-base laminates supplied by 21 laminators were made, and about 7,000 samples in all were tested. Data were reported on density, compressive strength, tensile strength, flexural strength, bearing strength, shear strength, flexural fatigue strength, and impact strength. The effect of temperature on physical properties was determined for some properties at —70 and 160° F.

Permanent Compounds for Fabrics

JOINT announcement was made by The B. F. Goodrich Co., Akron, O., and by Treesdale Laboratories, Inc., Pittsburgh, Pa., that the former will manufacture and sell Permaproof compounds for flameproofing and mildewproofing fabrics, as well as making them waterproof.

These new Permaproof compounds, developed by Treesdale, are claimed to enable fabrics so treated to withstand the most rigorous service conditions and to be permanent in effect. Fabrics treated with Permaproof, it is said, do not support combustion, ceasing to burn as soon as the direct flame is removed and the gases formed by decomposition of the compound extinguish the blaze. Among other stated advantages of Permaproof is that fabrics so treated will withstand normal outdoor weathering and numerous launderings and still retain flameproofing and mildewproofing characteristics. The compounds have the highly desirable quality of not tenderizing fabrics, but will actually increase their strength by at least 10%, with little effect on the "hand" or feel of the fabric, according to the manufacturer.

Two principal types of Permaproof are being marketed. The first, the Permaproof "100" series, is designed chiefly for treating tent, awning, hatch cover, and tarpaulin fabrics and other outdoor protective materials and is available either as a white translucent liquid or in colors. Solids content depends on the end use; the "100" series are approximately 85%. The fabricator can then dilute with ordinary mineral spirits to the desired concentration. The second type will be known as the Permaproof "200" series, designed chiefly for interior fabrics, such as curtains, drapes, rugs, upholstery fabrics, etc. It will have a solids content of approximately 60% and is inflammable. It may be diluted with water to the desired concentration. In addition to withstanding laundering, it has the further desirable property of resisting dry cleanings.

In the use of either type the required dry add-on (percentage of added dry weight based on original dry weight of the fabric) and the wet pick-up (percentage of added wet weight based on original dry weight of the fabric) determine the concentration to be used, with the dry add-on varying between 20 and 50%, depending on weight and weave of the fabric. Application of the compound is best by dip and nip (immersion and removal of excess liquids by squeezing) followed by drying at elevated temperatures. The method gives little masking of the colors when the translucent liquid is used on dyed fabrics. Good results can also be obtained by brushing and air drying. The material is available in one- and five-gallon cans and 30- and 55-gallon drums.

Consumption and Allocations of Chemicals

According to reports from the Bureau of the Census, United States Department of Commerce, consumption and allocations of phthalic anhydride, casein, formaldehyde, phenol, and aniline in 1944 were as given below. Total allocations for benzene and acetone are also given for the period of January 1, 1944, to June 30, 1945. In addition, figures on the production of aniline, dibutyl phthalate, and styrene (government-owned plants only) for the first four months of 1946 are also given, as reported by the U. S. Tariff Commission.

Chemical	Totals and End Uses	Quantity Lbs.	% of Total
Phthalic anhydride	Total consumption	124,473,000	100
	Esters (plasticizers)*	68,793,000	55.3
	Resins (mainly alkyds)	38,113,000	30.6
	Rubber chemicals	144,000	0.1
Casein	Total allocations (dry basis)	67,604,000	100
	Plastics	5,518,000	8.2
	Rubber	2,852,000	4.2
Formaldehyde (37%)	Total consumption	485,292,000	100
	Resins, total	243,375,000	50.3
	Phenolic	137,942,000	28.4
	Urea and melamine	101,048,000	21.0
	Others†	4,385,000	0.9
	Rubber chemicals	2,537,000	0.5
Phenol	Total allocations	205,186,000	100
	Triphenyl phosphate and other plasticizers	4,585,000	2.2
	Phenolic resins	106,655,000	52.0
Aniline	Total consumption	89,785,000	100
	Rubber chemicals‡	46,137,000	51.4
	Resins and plastics	1,553,000	1.7
		Gals.	
Benzene (1/1/44 - 6/30/45)	Total allocations	371,846,000	100
	Styrene	80,561,000	21.7
	Rubber chemicals	937,000	0.3
		Lbs.	
Acetone (1/1/44 - 6/30/45)	Total allocations	632,519,000	100
	Resins and plastics	31,095,000	4.9
	Rubber manufacture	16,566,000	2.6

* Mainly dibutyl phthalate, but some methyl, ethyl and amyl esters.
† Includes formaldehyde used in manufacture of synthetic resins such as polyvinyl, casein, cashew, phthalate, alkyl, and dimethylurea.
‡ Synthetic rubber additives such as cyclohexylamine, diphenylamine, and hydroquinone.

Production of synthetic organic chemicals in the U. S., January-April, 1946.

Chemical	Total	January	February	March	April
Aniline lbs.	27,713,581	7,070,695	6,411,349	7,607,352	6,624,185
Dibutyl phthalate. lbs.	4,329,413*	....	1,452,979	1,428,525	1,447,909
Styrene (govt. owned plants only), lbs.	115,577,148	27,060,428	25,867,056	30,870,809	31,778,855

* Three-month totals only, February-April, 1946.

Carpenter New A.S.T.M. Head

At the annual meeting of the American Society for Testing Materials held in Buffalo, N. Y., the week of June 24, Arthur W. Carpenter, manager of testing laboratories, The B. F. Goodrich Co. Akron, O., was elected president for the 1946-1947 term, succeeding J. R. Townsend, materials engineer, Bell Telephone Laboratories, Inc., New York, N. Y. Mr. Carpenter has been particularly active in the work of A.S.T.M. Committee D-11 on Rubber Products, having been secretary since 1928 and a member of more than ten of its subcommittees including the advisory committee. He has been very active in the Society's new work on ultimate consumer goods and is serving as a member of this administrative committee. He has served on the Society's administrative committee on papers and publications, is vice-chairman of the Cleveland District committee, and served on the A.S.T.M. executive committee from 1931 to 1933 and again from 1941 to 1943. He is completing a term as A.S.T.M. vice president. Mr. Carpenter has been associated with the rubber industry for almost 30 years, and his election to this high office of the American Society for Testing Materials is something from which the industry in general and his wide circle of friends in particular should derive considerable satisfaction.

Mr. Carpenter was born in Wellsville, N. Y., March 30, 1890. He received his B.S. degree in chemical engineering from the Massachusetts Institute of Technology in 1913 and his M.S. in 1914. He was city chemist, Alliance, O., in 1914 and assistant superintendent of Akron Municipal Water Purification Plant during 1915 to 1917. He served overseas in World War I and held the rank of captain in the U. S. Army Sanitary Corps from 1918 to 1919.

Harris & Ewing

Arthur W. Carpenter

He joined the Goodyear Tire & Rubber Co. in Akron in 1919, where he did technical service and compounding work until joining the Holtite Mfg. Co. in Baltimore, Md., as superintendent in 1922. Returning to Goodyear in 1923 he spent until 1926 with this company as a development compounder. Mr. Carpenter entered the employ of the Goodrich company in Akron in 1927 and in 1928 was made manager of testing laboratories, a position he still holds. During the late war he was a consultant in the WPB Conservation Division.

Mr. Carpenter is also a member of the American Institute of Chemical Engineers, the American Chemical Society, The National Society of Professional Engineers, and a Fellow of the American Institute of Chemists. He likewise belongs to Lambda Chi Alpha, Alpha Chi Sigma, and the Masonic Orders. Besides these many activities, Mr. Carpenter lists as his hobbies music, boating, swimming, golf, and stamp collecting. He is unmarried and makes his home at 56 Hamilton Ave., Akron, O.

Boston Group Outing

The ninth annual outing of the Boston Rubber Group was held at the Woodland Country Club, Newton, Mass., on June 28. The total attendance at the outing was 411, including 56 guests, and was the largest in the Group's history. The ideal weather contributed to the participants' enjoyment of the program of softball, darts, horse racing, golf, cards, and other impromptu sports during the afternoon, followed by a shore dinner served under a mammoth tent set up on the lawn.

In the golf contests 23 prizes were awarded. The kickers' handicap, tied by 10 contestants, saw seven prizes consisting of bonds, golf jackets, and golf balls awarded to C. H. Hamilton, C. E. Mayerhouser, A. L. Perry, R. Sherry, J. Mason, A. H. Sanford, and D. A. Canes. For low gross first prize of a golf bag went to W. Fuller; second prize, a pen and pencil set to F. Bommer; third prize, a golf jacket, to H. D. Bainbridge; and fourth prize, a gift certificate, to C. M. Davidson. Four prizes, consisting of a leather jacket, pen and pencil set, golf jacket and gift certificate, for low net were awarded to F. H. Langhorst, N. E. Dupree, Jr., H. B. Crooks, and S. Szulik, respectively. In the nearest-the-pin contest first and second prizes of gift certificates were presented to F. A. Newman and F. E. Gould, respectively. R. M. Mullowney won the first prize, a gift certificate, in the longest drive contest. Golf ball prizes for most 4's were awarded to W. Bommer and D. Gifford, and for most 7's to L. E. Packard, W. L. Edgeworth, and K. B. Osborne.

The first fall meeting of the group will be held on October 4 at the Copley Plaza Hotel in Boston. The speaker and the topic for this meeting will be announced at a later date.

CALENDAR

Aug. 16-17.	Los Angeles Rubber Group, Inc. Fishing Trip, Coronado Islands.
Sept. 9-13.	American Chemical Society, Chicago, Ill.
Sept. 10-14.	Chemical Show, Coliseum, Chicago, Ill.
Sept. 14-17.	National Association of Waste Material Dealers, Inc. Fall Convention. Palace Hotel, San Francisco, Calif.
Sept. 21.	Connecticut Rubber Group. Outing.
Oct. 1.	Los Angeles Rubber Group, Inc. Mayfair Hotel, Los Angeles, Calif.
Oct. 4	Boston Rubber Group, Copley Plaza Hotel, Boston, Mass.
Oct. 7-11.	National Safety Congress and Exposition, Chicago, Ill.
Oct. 18	New York Rubber Group.
Oct. 18.	Detroit Rubber & Plastics Group, Inc. Detroit Leland Hotel, Detroit, Mich.
Nov. 12.	Los Angeles Rubber Group, Inc.
Dec. 2-6.	American Society of Mechanical Engineers. Annual Meeting, New York, N. Y.
Dec. 3.	Los Angeles Rubber Group, Inc. Mayfair Hotel, Los Angeles, Calif.
Dec. 13	New York Rubber Group. Christmas Party.
Dec. 15.	Detroit Rubber & Plastics Group, Inc. Detroit Leland Hotel, Detroit, Mich.

Instrument Training Course

A TRAINING course designed to give a fundamental knowledge of the construction, operation and selection of electrical measuring instruments has been prepared by the Westinghouse Electric Corp., Pittsburgh, Pa. The intensive course includes sound slide films, a complete pocket-sized textbook, and an instructor's manual. Although primarily for use by the Westinghouse organization, the course has also been made available to educational institutions, engineering societies, and the engineering departments of all organizations that use electrical measuring instruments. Cost of a complete course, based on a class of 20 members, is $45, and distribution will be handled by the company's industrial relations department.

Subjects covered in films and lessons are: importance of electrical instruments; the permanent magnet moving coil mechanism; the electro-dynamometer mechanism; the stationary coil and moving iron mechanism; the rotating vane mechanism; and the selection and use of electrical instruments. It is recommended that the course be given in six one-hour sessions. An instructor's manual is provided which gives suggested classroom procedures and contains essential reference material.

Reference Table of Synthetic Rubbers[1]

H. A. Winkelmann[2]

Butadiene Copolymers
- Butadiene and Acrylonitrile
  - Hycar OR-15 and -25
  - Perbunan 18 and 26
  - Butaprene NXM, NL, NF, NA
  - Chemigum N-1, N-2
  - "Thiokol" RD
- Butadiene and Styrene
  - Butaprene SS
  - Chemigum S
  - Hycar OS-10
  - GR-S

1. Regular Polymers

	Soap	Coag.	Number	Mooney	% Conv.
Butadiene 76.5 Styrene 23.5	Fatty Acid Soap	Salt-Acid	GR-S-STD	45–55	72
			GR-S-85	90–110	77
			GR-S-X-181	90–110	
		Glue-Acid	GR-S-65	45–55	72
			GR-S-X-248	125–135	72
			GR-S-X-165A	55–65	77
		Alum	GR-S-20-AC	39–45	77
			GR-S-AC	45–55	77
			GR-S-12-AC	65–75	77
			GR-S-X-306-AC	45–55	77
			GR-S-X-311-AC	45-55	77
	Rosin Soap	Salt-Acid	GR-S-10	50–60	72-74
			GR-S-X-302	50–60	
		Alum	GR-S-X-222-AC	56–65	

2. Non-Staining—Non-Discoloring

	Soap	Coag.	Number	Stab.	Mooney	% Conv.
Butadiene 76.5 Styrene 23.5	Fatty Acid	Salt-Acid	GR-S-X-250	None	40–50	72
			GR-S-25	EFED	45–55	72
			GR-S-50	STAL	45–55	72
			GR-S-X-312		40–50	
		Alum	GR-S-X-317	EFED	39–45	
			GR-S-X-294	EFED	50–60	72
	Rosin Soap	Glue-Acid	GR-S-X-232	STAL	87–102	
			GR-S-X-272	STAL	95–105	80
		Salt-Acid	GR-S-X-273*	EFED	50–60	72
			GR-S-X-274*	STAL	60–70	72
			GR-S-X-233	STAL	87-102	
Butadiene 58 Styrene 42	Fatty Acid	Alum	GR-S-X-245	EFED	40–50	77
Butadiene 50 Styrene 50	Daxad-Rosin Soap	Salt-Acid	GR-S-X-304	STAL	100–110	

*GR-S-X-273 and GR-S-X- 274 shortstopped with sodium sulfide.

3. Cross-Linked GR-S Polymers

Butadiene 76.5 Styrene 23.5	Fatty Acid	Salt-Acid	GR-S-X-285*	BLE	55–65

*Contains 0.5% divinylbenzene.

4. Continuous Polymerization of GR-S

	Soap	Coag.	Number	Mooney	% Conv.
Butadiene 76.5 Styrene 23.5	Fatty Acid	Salt-Acid	GR-S-X-268 (110° F.)	45–55	72
			GR-S-X-269 (110° F.)	45–55	65
			GR-S-38	45–55	
		Alum	GR-S-X-242-AC (117° F.)	45–55	72
			GR-S-X-246-AC (124° F.)	45–55	72
			GR-S-X-221-AC (122° F.)	45–55	72
			GR-S-X-295	45–55	
	Rosin Soap	Salt-Acid	GR-S-X-282	50–60	72

5. GR-S Latices

Fatty Acid

Butadiene	Styrene	% Solids	Stab.	Number	Mooney	% Conv.
71.5	28.5	27-29	1.5	Type 1	45-55	77
71.5	28.5	27-29	None	Type 2	45-55	77
71.5	28.5	27-29	None	GR-S-X-309	45-55	

Fatty Acid-Nonhydrogenated-Hydroquinone Short Stop

% Solids	Number	Mooney
30	GR-S-X-299	
	GR-S-X-303	20–35

Daxad and Rosin Soap

Butadiene	Styrene	% Solids	Stab.	Number	
50	50	50-55	Non-stain	GR-S-X-270	75–100
50	50	55-60	None	GR-S-X-271	75–100

[1] This table was presented by Dr. Winkelmann in connection with a talk before the Chicago Production Conference in March, 1946. Its value in assembling all these facts on the present regular and experimental synthetic rubbers warrants publication for benefit of readers of INDIA RUBBER WORLD.

[2] Dryden Rubber Co., Chicago, Ill.

Daxad and Potassium Castorate

Butadiene	Styrene	% Solids	Stab.	Number	Mooney	% Conv.
70	30	50-60		GR-S-X-288		
			Daxad			
71.5	28.5	55-60	Stalite Hydro-quinone	GR-S-X-293	Very Soft	
71.5	28.5	55-60		GR-S-X-308	40-50	
	High	55-60		GR-S-X-310		High
			Rosin Soap			
70	30	58	None	GR-S-X-276		
50	50	37-39	None	GR-S Type 3	75-90	85-90
50	50	37-40	None	GR-S-X-160	75-90	85-90

6. GR-S Masterbatches

Filler	Number	Mooney	% Conv.
EPC Black 15 Pts./100 GR-S-10	GR-S-X-300	39-49	
EPC Black 15 Pts./100 3:1 Blend GR-S Standard and GR-S-10	GR-S-X-301	33-43	
EPC Black	GR-S-X-277	30	60
EPC Black	GR-S-X-275	30	72
EPC Black 50 Pts./100 GR-S	GR-S-BLK-1	35-45	72
EPC Black 50 Pts./100 GR-S	GR-S-BLK-1-AC	50	72
EPC Black 50 Pts./100 GR-S-10 Type	GR-S-X-314	30-40	
EPC Black 50 Pts./100 GR-S-10 Type	GR-S-X-296	40-50	
EPC Black 50 Pts./3:1 Blend of GR-S Std. and GR-S made at higher temp.	GR-S-X-297	33-43	
	GR-S-X-298	33-43	
SRF Black	GR-S-X-279	30	60
Buca A Clay	GR-S-X-283	50	77
Buca A Clay 100 Pts./100 GR-S Nonstain	GR-S-X-292	40	
Silene 50 Pts./100 GR-S Nonstain	GR-S-X-315	40	
Crown Clay 100 Pts./100 GR-S EFED	GR-S-X-316	40	

Butadiene-Methylpentadiene Copolymer
- Soft
- Hard

Butene Polymers
- Isobutylene and butadiene or isoprene
  - Butyl (GR-I)

Chloroprene Polymers
- Neoprene E, G, GN, M, I, GR-M

Chloroprene and isoprene
- Neoprene FR

Chloroprene and acrylonitrile
- Neoprene ILS

Polyisoprene
- GR-S-X-116
- GR-S-X-281

Isoprene-Styrene Copolymer
- GR-S-X-141

Polymethylpentadiene
- Soft
- Hard

Organic Polysulfides
- "Thiokol" A, FA
- "Thiokol" B, D
- "Thiokol" N
- "Thiokol" ST

Polyesters
- Paracon
- Paraplex X-100, S-200

Silicones
- Silastic

Polyacrylates
- Lactoprene

Miss Mayfair (Kay Hughes) holds scroll presented to William Jeffers (center) in appreciation of his war job as rubber chief by C. M. Reinke, of Los Angeles Rubber Group, Inc., at the June 11 meeting of the Group at the Mayfair Hotel, Los Angeles Calif.

Mold Release Fluid Emulsion

DC MOLD release fluid emulsion No. 35, an emulsion of Silicone mold release fluid of Dow Corning Corp., Midland, Mich., has recently been made available for use as a release agent in the molding of various types of natural and synthetic rubber. The principal advantages of the emulsion are stated to be: (1) gives effective release for several moldings; (2) does not build-up on the mold surface and therefore reduces cleaning expenses; (3) permits a faster molding cycle because molded products can be removed from the mold before it is completely cooled; (4) eliminates the breaking-in period normally required for new molds; (5) enables molding rooms to be kept clean and free from dust and powders; and (6) is effective in most molding operations in concentrations containing as little as one part emulsion to 140 parts water and is therefore economical to use and easy to apply.

Zinc Stearate Dispersion—Aquazinc

AQUAZINC, an aqueous dispersion of zinc stearate, has been announced by the Beacon Co., Boston, Mass. In the production of the new material, zinc stearate is dispersed in water with the aid of a wetting agent which will volatilize at or below the temperature of boiling water. Aquazinc can be used to advantage in the manufacture of cements, neoprene adhesives, coated paper, Butyl rubber, and all types of rubber latex. In addition it offers a convenient method of applying zinc stearate to molded goods, for Aquazinc can be diluted with water and sprayed on the molded goods before curing. Because of its water dispersibility, many new applications for the use of the product can be found which were previously prohibited by the water insolubility of powdered zinc stearate. Aquazinc, furthermore, is economical and efficient since it can be applied with uniformity and with no loss. It also eliminates the dust, fire hazard, inconvenience, and other difficulties accompanying the use of powdered zinc stearate.

Shipments and Consumption of Plastics and Resins

THE following statistics represent the shipments and consumption, in pounds, of plastics and synthetic resins for the first quarter of 1946, as reported to the Bureau of the Census, United States Department of Commerce, Washington, D. C., by 77 manufacturing companies and company departments. Data for coating resins, however, are not included.

	January	February	March
Cellulose acetate and mixed ester plastics:*	8,253,879	7,573,454	8,255,472
Nitrocellulose plastics:*	1,514,272	1,435,236	1,520,922
Phenolic and other tar acid resins:			
Laminating (dry basis)	2,298,813	1,806,919	2,052,005
Adhesives (dry basis)	1,070,902	991,233	1,194,389
Molding materials*	10,739,472	10,606,487	12,286,204
All other (dry basis)†	4,413,038	4,331,994	4,229,231
	18,522,225	17,736,633	19,761,829
Urea and melamine resins:			
Adhesives (dry basis)	2,650,044	2,794,506	3,224,959
Textile and paper treating (dry basis)	1,071,084	995,776	1,034,940
All other (dry basis)†	235,687	167,559	130,296
	4,956,775	3,957,841	4,390,195
Polystyrene	4,011,334	3,007,122	2,727,579
Vinyl resins:			
Sheeting and film*	1,569,044	1,665,666	2,161,230
Textile and paper coating resins	1,650,026	1,034,511	1,688,890
Molding and extrusion*	5,496,024	5,910,429	6,664,970
Adhesives and all other†	751,427	988,824	1,276,241
	9,566,521	9,599,430	11,791,331
Miscellaneous plastics and resins*†‡	7,277,720	7,111,159	8,165,270
Totals	54,102,726	50,420,875	56,612,598

* Includes fillers, plasticizers, and extenders.
† Excludes data for protective coating resins.
‡ Includes data for ethyl cellulose, urea, melamine, acrylic acid, petroleum resins, ester resin mixtures and miscellaneous synthetic resin materials.

Plastics Technology

Integration of the Plastics and Rubber Industries [1]

R. P. Kenney[2]

THE primary aim of my talk will be to develop the thesis that many phases of the rubber and plastics fabricating industries of prewar years have in effect lost their separate identities owing to the fact that their end-products, raw materials, and therefore their interests have become interchangeable. Before I begin to develop this subject may I say that this paper is my own personal attempt to look into the future of the rubber and also the plastics industries.

The chief catalysts or driving agents in the amalgamation of these two hitherto distinct industries, in my opinion, have been the polyvinyl plastics and certain types of synthetic rubbers. For the purposes of this talk I will refer only to the acrylonitrile-butadiene type of synthetic rubbers.

Thanks to the fine research work of the laboratories of the rubber and chemical companies, the allied war effort had a basic knowledge of these new materials available at the outbreak of hostilities. Under the impetus of war requirements these products—polyvinyls and acrylonitrile synthetic rubbers—have grown from more or less pilot-plant curiosities in 1939 to large industries in their own right.

Some rubber manufacturers were using small quantities of thermosetting plastics in 1939, but, as a general rule, hard rubber was still their answer to the plastics industry. On the other hand the plastics industry used very little, if any, natural rubber in any of their operations. The only then generally available plastics were rigid, and therefore it was natural that their interest had not developed in the elastomeric field.

In comparing the position of these newcomers in the fields of rubber and plastics with relation to the older industries, it was natural at first that the synthetic rubbers would be accepted and used more readily by the rubber industry than by the plastics industry since generally synthetic rubber looks like natural rubber and, as far as end-uses, compounding, and processing is a most similar product. Likewise it was also natural that the thermoplastic vinyl polymers should first arouse interest in the plastics industry since their processing characteristics were similar to the older well-known thermoplastic molding and extruding materials. These versatile new plastics also offered the possibility for the plastics fabricators to expand widely the types of products which could be made from plastics by serving as an opening wedge for their entrance into the elastomeric field, hitherto the exclusive domain of the rubber manufacturers.

We thus come to the position where we find the rubber industry accepting synthetic rubber and the plastics industry adopting the elastomeric polyvinyls.

Integration Accelerated by War

After the outbreak of the war the rubber industry was faced with impending raw material shortages as well as the necessity of supplying new and radically different products to the Army, Navy, and Air Forces. Why was it logical then that their first attention should go to the elastomeric polyvinyls? I believe there were several reasons which should be mentioned:

(a) In the first place it was immediately apparent to the rubber chemists that in molecular structure the polyvinyls and synthetic rubbers were very similar.

(b) The second important property of the polyvinyls which attracted the rubber fabricators was the fact that they could be handled on standard rubber equipment with only minor adjustments. It is not necessary to stress further the importance of this fact in hastening the adaptions of polyvinyls to such equipment as rubber mills, calendars, extruders, etc.

(c) The third and probably most important factor in stimulating the rubber industry's interest in polyvinyls was the fact that these materials could be used interchangeably with synthetic rubber for certain applications. For example, it was possible to make items such as coated fabrics, flexible tubing, and insulated cable out of polyvinyl plastics as well as synthetic rubber. In fact in some cases the use of these plastics offered advantages over synthetic rubber such as ease of processing or in superior chemical or physical properties of the final product. In any case this interchange of end-uses made it impossible for the rubber industry to continue to ignore developments in the vinyl plastic field. Conversely, of course, it also became imperative that plastics fabricators, such as extrusion companies, must suddenly take a keener interest in the rubber industry since their elastomeric vinyl extrusions had put them in some cases in direct competition with similar products made from rubber. Until the advent of the polyvinyls the plastics extruders had confined their interest to rigid products.

This growing interest by the rubber industry in new plastics was not a one-way movement. As the plastics industry began to broaden into the elastomeric field, it also started to investigate the properties and possibilities of new materials. And conversely for the same reasons that I have previously mentioned, its attention was naturally focused on the new synthetic rubbers.

Now, let us look at the results of this reciprocity in interests.

As the laboratories of the rubber and plastics companies began to experiment with the various polyvinyls and synthetic rubbers, they soon discovered that some polyvinyls were compatible with certain types of synthetic rubbers. By the process of elimination it became apparent that the combinations showing the most promise were those mixtures of vinyl chloride-type polymers and acrylonitrile-type synthetic rubbers (GR-A).

Vinyl Chloride-GR-A Blends

Continuing development work soon showed that the addition of certain vinyl chloride-type plastics to acrylonitrile rubbers offered many very definite improvements in the finished product. Some of the properties imparted are as follows:

(1) INCREASED FLEX LIFE. Tests have shown that some products made from these blends have double the flex life in

[1] Presented before Rubber Division, C.I.C., Toronto, Ont., June 25, 1946.
[2] B. F. Goodrich Chemical Co., Cleveland, O.

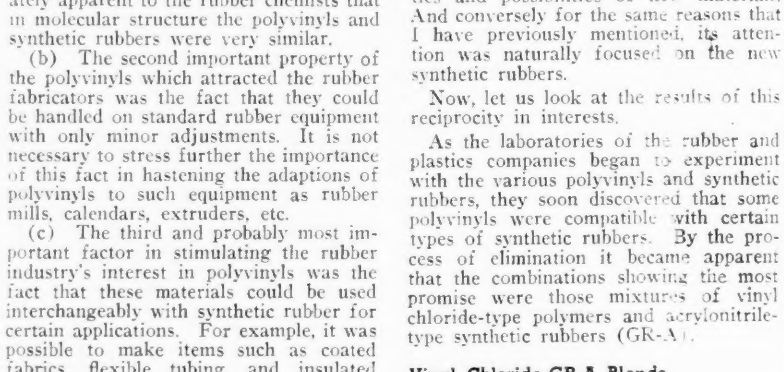


Fig. 1. Mixtures of acrylonitrile synthetic rubber (Hycar) with plasticized polyvinyl chloride (Geon) are shown on this chart. The mixtures combine in varying degrees, the sunlight and ozone resistance of polyvinyl chloride with the oil-resistant and thermosetting properties of the synthetic rubber. A favorable combination of properties was found with a mixture of 75% nitrile-type synthetic rubber and 25% plasticized polyvinyl chloride

RESULTS OF SUNLIGHT RESISTANCE TESTS

Composition	Sample Number								
	1	2	3	4	5	6	7	8	9
% Geon	0	10	20	25	30	40	50	75	100
% Hycar	100	90	80	75	70	60	50	25	0

RESULTS OF OZONE RESISTANCE TESTS

Composition	Sample Number								
	10	11	12	13	14	15	16	17	18
% Geon	0	10	20	25	30	40	50	75	100
% Hycar	100	90	80	75	70	60	50	25	0

comparison to the same product made entirely with synthetic rubber.

(2) Sunlight and Ozone Resistance. By the incorporation of 25% or more vinyl chloride type of resin into a synthetic rubber compound there is a remarkable increase in the resistance to sunlight and ozone. Figure 1 shows the results of sunlight and ozone exposure on some of these blends.

One case where this improved synthetic rubber compound was invaluable to the war effort was in the manufacture of fuel cell fittings for the Allied air forces. You are all no doubt familiar with this application and with the improvements which were shown when vinyl chloride resins were combined with acrylonitrile-type rubber. Other properties are:

(3) Reduced Flammability. It is logical to expect that the strictly noninflammable vinyl resins would impart this quality to the more flammable synthetic rubber.

(4) Reduced Creeping in Lightly Loaded Stocks. The vinyl resin serves as a loading material and helps to cut down the nerve of the rubber.

(5) Improved Abrasion Resistance. Addition of vinyl plastics markedly increased the abrasion resistance of the final product.

Other laboratories approached this problem from the point of adding synthetic rubber to vinyls to give a compound which was thermoplastic, but also showed superior properties over the pure resin. Exhaustive tests proved that in fact synthetic rubber does make a number of very definite contributions to a vinyl compound.

In the first place it was possible to decrease the amount of ester-type plasticisers formerly used. These plasticizers not only tend to be volatile, but also some of them have the very objectionable property of being extractable. The use of synthetic rubber reduced this fugitive tendency, thereby increasing the resistance of vinyl compounds to staining and attack on varnished surfaces.

By substituting synthetic rubber for some of the chemical plasticizer in a vinyl compound it was also found that the oil resistance was greatly improved. This condition is due to the fact that chemical plasticizers are usually extracted by oil; while acrylonitrile synthetic rubbers are virtually unaffected.

Another important feature of adding synthetic rubber was that it opened the possibility of higher loading, therefore giving lower cost compounds. This advantage is due to the fact that synthetic rubber, as you all know, has a higher tolerance for inert filler than vinyls.

Other advantages which these synthetic rubbers impart to a vinyl chloride plastic compound are improved elongation, improved compression set and cold flow characteristics, greater resiliency, and improved low-temperature flex life —for example such blends can be used at temperatures about 25° C. lower than conventional vinyl plastics.

A final and very important property which synthetic rubber gives the vinyl compound is the ability under proper conditions to pull it from a hot mold without tearing. In other words it is now economically possible to compression mold *thermoplastic* products from polyvinyls by eliminating the necessity of cooling the molds. This consideration is not a theoretical one, but several large rubber fabricators are actually taking advantage of this property in

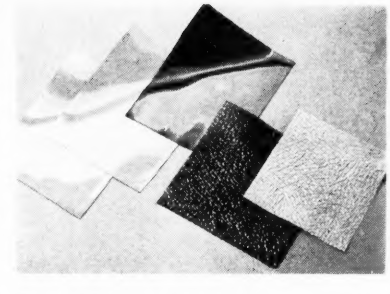


Fig. 2. The samples shown here are fabricated from certain combinations of synthetic materials. The three highly polished samples at the left are compositions of polyvinyl chloride plastic and acrylonitrile synthetic rubber. The embossed material at the right is a combination of phenolic resin with synthetic rubber. All of these samples are from unsupported calendered sheeting

their standard production operations. In these cases the "nervy" uncured synthetic rubber adds enough strength to the more thermoplastic polyvinyl to permit handling at elevated temperatures.

Examples of Plastic-Rubber Blends

In my discussions above I have dwelt chiefly on the results of combinations of vinyl chloride resins and synthetic rubbers. More recently some very startling results have been obtained by combining acrylonitrile rubbers with phenolics and by a three-way combination of polyvinyls with phenolics and synthetic rubbers. The possibilities indicated by this new work are so tremendous that it is impossible even to estimate the new horizons which have been opened up.

Some examples of polyvinyl-synthetic rubber blends as well as products made by these various combinations with phenolics that show new potentialities are as follows:

Upholstery Material. In this instance synthetic rubber has been added to the polyvinyl in order to improve such properties as tear resistance, flexibility, and permanent set characteristics. The synthetic rubber also replaces in part chemical plasticizers, thereby decreasing any tendency for extraction on varnished surfaces. This compound is thermoplastic and processed in the same manner as 100% polyvinyl compounds.

Hose. Gasoline hose is an example of an instance where a vinyl chloride resin has been added to a synthetic rubber to impart certain desirable characteristics, but at the same time to give a cured compound which is still processed the same as the rubber. The cover stock for this new gasoline hose is made from a polyvinyl-synthetic rubber compound in order to improve its abrasion resistance and sunlight aging properties.

Patent Leather. This patent leather differs from the straight polyvinyl material in that it is a 50-50 combination of polyvinyl chloride and Hycar synthetic rubber *with no chemical plasticizers whatsoever*. It is not a laboratory curiosity for it has actually been made on production equipment. Some of the advantages of this compound over the standard plastic patents are elimination of any tendencies for bleeding of the

Fig. 3. The products shown here are composed of certain combinations of polyvinyl chloride plastic, phenolic resin, and acrylonitrile synthetic rubber. The samples include an ice bucket, propeller deicer ring, shoe sole, gasoline hose, and an industrial screw driver

chemical plasticizer, improved low-temperature characteristics, improved heat aging, improved physical properties such as flexibility, tear, and feel. These are only a few of the potential applications of polyvinyls and acrylonitrile synthetic rubber.

Blends with Phenolics

Compounds prepared from a combination of polyvinyl chloride and/or acrylonitrile rubber with phenolic resins show a wide range of possibilities ranging from a soft elastomeric compound to a hard, tough compound. Examples of these combinations are:

Propeller Deicer Rings. In the case of a deicer ring, phenolic is added to give a slight firmness or rigidity to the compound which could not be obtained otherwise. The polyvinyl chloride contributes to the abrasion resistance as well as the aging characteristics.

Industrial Screw-Driver Handle. The phenolic used in a screw-driver handle gives a hard compound without the need of excessive quantities of sulfur and accelerators. In this case the phenolic seems to act as a curing agent by replacing sulfur. This substitution improves the electrical properties of the compound as well as gives a product of superior impact strength. The polyvinyl chloride is added also to improve electrical characteristics.

The Ice Bucket. Many fabricators of hard phenolic molded items have discovered that the addition of certain acrylonitrile-type synthetic rubbers produces a higher quality product than has been possible heretofore with straight phenolics. An example of such an application is an ice bucket to which a small amount of synthetic rubber has been added to give the following improvements: decrease in brittleness of the compound; extremely high impact properties; improved water resistance and therefore dimensional stability; improved chemical resistance.

Embossed Upholstery Material. Here is a product the ultimate possibilities of which may even be greater than some of the products mentioned earlier. This embossed upholstery material is made by a combination of phenolic resin with synthetic rubber.

I must admit that we do not know yet exactly what does happen in this combination although there are many theories. It may be there is a cross-linking reaction between the rubber and the phenolic or possibly the phenolic may enter into condensation in a separate phase from

the rubber. In any case the results are that we get a cured unsupported sheet which has superior properties to a similar plasticized polyvinyl chloride unsupported sheet. Some of the advantages over a straight vinyl resin sheet are improved tear and tensile strength, better abrasion resistance, no problems of plasticizer transfer since no chemical plasticizer is present, and also utility over a wider range of temperatures. Since this work is quite new, we do not have enough technical information to more than mention it at this time.

Effect on Future of Rubber and Plastics Industries

As these products indicate, this interchange of end-use will have a profound effect on the future planning of the rubber and plastics industries.

In the first place each industry has acquired new and valuable tools (or raw materials) which will greatly expand its field of endeavor. This point is particularly important when engineering new end-products. The rubber compounder must have a complete knowledge of these new plastic materials if he is going to obtain the best compound for any particular application. Conversely, of course, the plastics engineer also must be familiar with the synthetic rubbers if he will successfully meet competition in engineering new end-uses.

Secondly, it is important to point out that these two industries are becoming more and more dependent on the same raw materials. Thus their mutual interests are further cemented. In the past (that is before the war) the rubber industry had no more than a secondary interest or dependence on what happened in the chemical industry. Now the rubber industry is vitally concerned if the chemical plants lose production on phthalic anhydride (and therefore phthalate plasticizer), or whether the caustic plants have a strike which will mean loss of chlorine. The plastics industry, although always more dependent on the chemical industry, now has to consider carbon black production, various rubber chemicals, and chemical softeners which in the past were chiefly important to the rubber fabricators. This awareness of common raw materials is a direct result of the amalgamation of interests of the rubber and plastics industries, providing another cogent reason why these two groups must face the future together.

Finally, and most important, these new materials we have discussed will have a profound effect as far as economic considerations are concerned on the future of both industries. When the tools (or raw materials) of each become interchangeable, this condition will mean that they are both subject to the same economic influences. The rubber fabricator whose main concern in the past was the world price of crude rubber now will have to be aware at all times of the prices on a hundred and one different synthetic, rubber, plastic, and chemical raw materials. A sudden price fluctuation in these products now may cause a serious financial dislocation in his plans. The plastics fabricator will also suddenly find that he is extremely interested in the world rubber market as it may affect costs and therefore prices of his competitors.

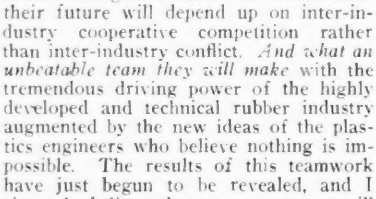
Another economic aspect which will be influenced by this interchange of interests is that the rubber manufacturer will have to judge on a different basis the production costs of his competitors in the plastics industry. In other words it was quite easy for competitors in the rubber industry to estimate each other's costs based on capital investments, overhead, labor, etc., since their equipment was more or less uniform, and over a period of years each knew pretty well what the other was doing. Now, however, the new, and oftentimes streamlined plastics fabricators have come into their picture, and it is not so easy to determine just what costs—and therefore selling prices—may be. This misjudgment of the plastics fabricators costs is due to the fact that there are great differences in their capital investments as well as the fact that many have only recently entered business and therefore were able to take advantage of the latest and more efficient equipment designs while the rubber fabricator may have had to convert less satisfactory machinery.

Summary and Conclusions

In closing then, I feel that it should be emphasized that these new developments which have been mentioned are simply a warning that the thinking and future plans of the rubber and plastics industry will have to be reexamined in a new light. In other words these two industries should realize that they are now competing together on the same ground and under the same rules as free competitors with no more isolating influences. In fact I am not at all sure that the word "competitor" alone is correct. I believe that these two industries are really acting as a team going in the same direction together with the result that their future will depend up on inter-industry cooperative competition rather than inter-industry conflict. *And what an unbeatable team they will make* with the tremendous driving power of the highly developed and technical rubber industry augmented by the new ideas of the plastics engineers who believe nothing is impossible. The results of this teamwork have just begun to be revealed, and I sincerely believe that years to come will find these combined forces contributing immensely not only to the development of the chemical industry, but to civilization and the world.

Cellophane Spangles

THE Rayon Processing Co. of R. I., Inc., Central Falls, R. I., is now in production on "Cellophane Spangles," a surface coating consisting of very finely cut particles of cellophane. Produced at present only in white (clear), the spangles, when applied to a surface, give it a distinctive sparkle due to the reflection of light by the millions of tiny facets.



Cellophane Spangles for Coatings or Fillers

In general the spangles are applicable anywhere that flock is used for decorative purposes: on greeting cards, box papers, novelty book covers, displays, signs, packages, etc.

The spangles can be applied to textiles by dot printing in a manner similar to that used for flock. In colored transparent plastics the materials can be used as a novelty filler giving a distinctive crystalline effect. When used as a decorative coating a colored effect can be achieved with the clear spangles by using colored adhesives. The lively sparkling finish produced is not only novel, but also tough and durable. Spangles may be applied to paper, cardboard, cloth, wood, plastic, metal, rubber, glass, and practically any other surface.

National Plastics Exposition

THE second National Plastics Exposition will be held May 5 to 11, 1947, at the Chicago Coliseum, Chicago, Ill., it was announced by the Society of the Plastics Industry, 295 Madison Ave., New York, N. Y. Conference headquarters for the exposition, which is also the industry's annual convention, will be at the Stevens Hotel, near the Coliseum. According to the SPI, Chicago was chosen because of the great concentration of plastics industry in the central region and the potential development of that area. The Chicago exposition is expected to surpass this year's New York show in both display and attendance, although 87,000 persons visited the New York exposition, and public admission had to be limited to allow proper time for industrial representatives to study the exhibits.

New Fiberglas Cloths for Coating

FOUR new Fiberglas cloths designed specifically for use as a base for coated fabrics have been announced by Owens-Corning Fiberglas Corp. The cloths are suitable for coating, by the knife method, with high solids vinyl resin compounds of synthetic rubbers. Outstanding property of the cloths is their retention of tensile strength under moist conditions when the cloths are given an after-treatment recommended by the manufacturer. Suggested uses of the coated Fiberglas cloths are coverings for outdoor furniture, awnings, canopies, tarpaulins, aprons, shower curtains, and industrial cloths.

The new cloths are woven of continuous filament Fiberglas yarns, and are identified as 119-A, 126-A, 138-A, and 190. Data on each of the cloths are given in the following table.

	Cloth Nos.			
	119-A	126-A	138A	190
Net width—in...	38	38	38	38
Thickness, in...	0.004	0.0065	0.007	0.006
Type of weave..	Plain	Plain	Crwft. satin	10mesh Leno
Yarn	450-1/2	450-3/2	450-2/2	225-1/3
Weight, oz./sq. yd.	2.7	5.4	6.7	2.6
Min. breaking strength:				
Warp, lbs....	75	225	260	100
Fill, lbs.	60	195	260	58

Selvages of all cloths are one-quarter inch. The minimum breaking strength values given in the table are intended as guides not specifications.

NEWS of the MONTH

Highlights—

Prospects for continued high-level production in the industry for the remainder of 1946 appear good although there is some opinion expressed that because of a change from a seller's to a buyer's market by 1947 and because of certain fabric and beadwire shortages, a certain amount of reduction of output in some branches of the industry might result. An increase in the permitted use of natural rubber from 20 to 40% of total natural and synthetic rubber to be used in the third quarter will prevent any curtailment of production because of basic raw material supply. Congress by indirect action gave approval of the disposal of certain styrene, furfural, and carbon black plants, two alcohol-butadiene plants, and copolymer plants not to exceed 20% of the total capacity of all such plants. The Second Report of the Inter-Agency Committee on Rubber was released July 29. This report recommended that Congress declare as essential to the national security of the United States the maintenance of a synthetic rubber industry whose production will be continuously used and the establishment of a national rubber supervisory body to supervise and coordinate all governmental activities relating to a national rubber policy. The strike at the three plants of the General Tire & Rubber Co., which began on June 21, was still continuing. U.R.W.A. convention scheduled for September in San Francisco should provide an indication of the attitude of organized labor in the industry on wage and other demands for the next 12 months.

Production Outlook Variable; Changing Rubber and Component Situation Complicating Factor

Expressions of opinion regarding the production outlook for the industry for the remainder of 1946 and early 1947 have become somewhat variable, with some authorities predicting continued high-level output and others warning of a reduction in production volume. An increase in the permitted use of natural rubber from 20 to 40% of the total natural and synthetic to be used during the third quarter of 1946 will avoid any production curtailment connected with total rubber availability, but will at the same time reduce production output somewhat because of the necessity of compounding and processing adjustments. Fabric and beadwire supply may interfere with production of rubber products requiring these components. The Federal Trade Commission accused 37 manufacturers or distributers of rubber heels, soles, and accessory products of a conspiracy to fix prices.

Industry Performance and Trends

The production of passenger-car tires for the first half of 1946, estimated at about 32,000,000 units, and the possibility that at least an equal number may be produced during the second half of this year, coupled with the continued low original-equipment demand, lead to the belief that the supply-demand picture may be pretty much in balance by January, 1947. The high production of other rubber products may also result in some slowdown in demand within the next few months.

Another issue of Standard & Poor's "Industry Surveys on Tire and Rubber," dated June 28, makes the following comment:

"The rubber fabricating industry is operating at a record peacetime rate. Material shortages may temporarily dislocate production schedules, but the industry's sales this year will be sharply above prewar levels, and new peaks are possible for some of the smaller factors. Margins will probably be narrower than wartime spreads, but, aided by reduced tax rates, probable absence of special charges and the likely reduction or elimination of reserves, year-to-year earnings gains will be sharp.

"Carbon black is not likely to be a bottleneck. On the other hand, the situation with regard to bead wire and textiles is much less favorable. Production of wire is being retarded somewhat by unsatisfactory OPA ceiling prices, and the shortage of fabrics, which has been most critical in the case of such non-tire products as mechanical goods, footwear, and coated materials, has now spread to tire output, including cord and chafers. However, progressive improvement is expected over the remainder of the year, particularly in view of expected liberalization of pricing policies. *Thus, no more than temporary dislocations should ensue.*"

The nation's supplies of rubber, synthetic and natural, now appear adequate to maintain the rubber industry at its all-time record production rate for the full year 1946, John L. Collyer, president of The B. F. Goodrich Co., stated in mid-July.

"The output of rubber products of all kinds in the United States for the first six months of 1946 was above the highest rate in history. It is now estimated that consumption of synthetic and natural rubbers in this country this year will approach 1,000,000 tons, over 70% of which will be synthetic," Mr. Collyer said. "The nation used 651,000 tons of rubber in 1940—of which only 2,500 tons was synthetic—a prewar consumption record.

"It will be sometime in 1947 before we have enough natural rubber to test fully its relative worth with synthetic rubber. The hope for natural rubber lies in its ability to remain competitive with synthetic rubbers produced by American industry," he added.

A survey of automobile owners made by the Crowell-Collier Publishing Co. revealed that a buyer's market may develop in tires by early 1947. The survey was made in 64 urban communities of varying sizes throughout the nation in April, and it was determined that the replacement needs, as appraised by car owners themselves, were for 30,000,000 tires. Even the most optimistic do not expect more than 2,000,000 new cars requiring 10,000,000 tires, to come off the assembly line between April and next January. An additional 10,000,000 tires for dealer inventory and export would place the years' demand at 50,000,000, compared with an aggregate production, at the current rate of 5,500,000 a month, of 44,000,000 for the last eight months of this year. This leaves an unsatisfied demand of 6,000,000, which could be eliminated with slightly more than one month at the present production rate.

About 31% of the tires in use when the survey was made were recaps, and one out of every five owners expressed dissatisfaction with them. While the other 80% found them a suitable substitute during the wartime period of restricted driving, most autoists—85%—indicated they would buy new tires rather than have old ones retreaded when replacements become necessary or new ones become available.

According to another authority, total rubber consumption in May equalled that of April, and it was stated that this was very probably the peak for 1946. Consumption of synthetic rubbers during May was about 70,400 tons, and this figure added to natural rubber consumption of about 17,900 tons, gave a total rubber consumption of 88,300 tons. Consumption of reclaimed rubber for May was 22,200 tons.

Production of GR-S during May was about 55,300 tons, and output of total synthetics for the month was slightly more than 66,000 tons. With about 11,000 tons of GR-S exported in May, stocks on hand at the end of May fell to 80,000 tons. Stocks on hand of other synthetics remained about the same as in April although a rather sharp increase in export shipments of Buna N from 57 tons in April to 629 tons in May dropped stocks to about 3,700 tons.

If there is a decline in rubber consumption during the latter half of 1946 and with the increased amount of natural rubber available for use, problems of compounding and cost may become increasingly significant to rubber goods manufacturers. Most companies have orders for new machinery and improved equipment which have not been filled as yet, and if a further expansion of productive capacity takes place at about the same time that the demand for rubber products begins to decline, competition will be much greater.

RMA Production Figures

Passenger-car tire production in May was 5,700,306 units, the highest monthly output since June, 1929. This production represented a 3.4% increase over April, 1946, and increased the cumulative total since the first of the year to 25,815,820 units, The Rubber Manufacturers Association, Inc., reported.

Production of truck and bus casings declined 0.6%, while inventory increased

Estimated Automotive Pneumatic Casings and Tube Shipments, Production and Inventory—May-April, 1946, First Five Months, 1946-1945

	Original Equipment	Replacement	Export	Total Shipments	% of Change from Preceding Month	Production during Month	% of Change from Preceding Month	Inventory End of Month	% of Change from Preceding Month
Passenger Casings									
May, 1946	894,776	4,730,347	51,137	5,676,260	−1.66	5,700,306	+3.36	2,386,483	+2.56
April, 1946	774,663	4,751,841	57,136	5,583,640		5,514,751		2,326,918	
First five months, 1946	2,817,146	22,238,650	219,990	25,275,786		25,815,820		2,386,483	
1945	116,884	8,027,122	81,208	8,225,214		8,079,254		810,566	
Truck and Bus Casings									
May, 1946	364,411	930,446	61,201	1,356,058	−3.53	1,360,482	− .56	990,759	+1.42
April, 1946	330,106	1,004,308	71,295	1,405,709		1,368,157		976,873	
First five months, 1946	1,328,014	4,734,416	309,832	6,372,262		6,587,929		990,759	
1945	2,812,734	5,704,674	72,449	8,589,857		8,652,699		763,870	
Total Casings									
May, 1946	1,259,187	5,660,793	112,338	7,032,318	+ .61	7,060,788	+2.58	3,377,242	+2.22
April, 1946	1,104,769	5,756,149	128,431	6,989,349		6,882,908		3,303,791	
First five months, 1946	4,145,160	26,973,066	529,822	31,648,048		32,403,749		3,377,242	
1945	2,929,618	13,731,796	153,657	16,815,071		16,731,953		1,574,436	
Passenger, Truck and Bus Tubes									
May, 1946	1,268,301	4,903,209	106,702	6,278,212	+3.28	6,462,794	+5.70	4,373,316	+4.39
April, 1946	1,112,845	4,842,499	123,604	6,078,948		6,114,247		4,189,533	
First five months, 1946	4,239,046	21,930,343	509,794	26,679,183		27,930,451		4,373,316	
1945	2,962,383	12,968,307	101,178	16,031,868		16,168,468		2,438,397	

1.4%, indicating that the industry is meeting most shipment demands.

The FTC Complaint

The Federal Trade Commission, Washington, D. C., on July 3, in Complaint No. 5448, alleged conspiracy to fix prices by 37 manufacturers and distributers of rubber heels, soles, and accessory products.

Trade associations named as respondents are The Rubber Manufacturers Association, Inc., Heel & Sole Division, 444 Madison Ave., New York, N. Y., and George Flint, chairman of the division; Rubber Heel & Sole Manufacturers Association, 551 Fifth Ave., New York, and R. S. Crawford, general director; and the Connecticut Leather & Findings Association, Inc., 242 Bank St., Waterbury, Conn., and Harry Diamond, secretary.

The complaint charges among other things, that the respondents, by agreement, have exceeded the sanctions provided in Fair Trade Acts in various states and the Miller-Tydings Act in fixing uniform resale prices and have conspired among themselves to obtain OPA approval of prices and resale prices "jointly desired and previously agreed upon by respondents."

Respondent members of the RMA Heel & Sole Division, are:

Auburn Rubber Corp., Auburn, Ind.; Avon Sole Co., Avon, Mass.; Dryden Rubber Co., Chicago, Ill.; Essex Rubber Co., Trenton, N. J.; B. F. Goodrich Co., Akron, O.; Goodyear Tire & Rubber Co., Akron; Alfred Hale Rubber Co., North Quincy, Mass.; Holtite Mfg. Co., Baltimore, Md.; Hood Rubber Co., Watertown, Mass.; I. T. S. Co., Elyria, O.; O'Sullivan Rubber Co., Inc., Winchester, Va.; Panther-Panco Rubber Co., Inc., Chelsea, Mass.; Seiberling Rubber Co., Akron; United States Rubber Co., New York.

Members of the Rubber Heel & Sole Manufacturers Association named as respondents are:

Avon Sole Co.; Bearfoot Sole Co., Inc., Barberton, O.; Beebe Bros. Rubber Co., Nashua, N. H.; Bradstone Rubber Co., Woodbine, N. J.; Hagerstown Rubber Co., Hagerstown, Md.; Alfred Hale Rubber Co.; Hanover Rubber Co., West Hanover, Mass.; Holtite Mfg. Co. Lynch Heel Co., Chelsea, Mass.; Monarch Rubber Co., Inc., Baltimore; Norwalk Tire & Rubber Co., Norwalk, Conn.; Panther-Panco Rubber Co.; Plymouth Rubber Co., Inc., Canton, Mass.; Quabaug Rubber Co., North Brookfield, Mass.; Travelite Rubber Co., Inc., Boston; Victor Products Corp., Gettysburg, Pa.; and Webster Rubber Co., Auburn, Me.

Jobber members of Connecticut Leather & Findings Association, Inc., all located in Connecticut are:

Bridgeport Leather Co., Bridgeport; Maurice Greenberg, trading as Connecticut Leather Co., Hartford; Diamond Leather Co., New Haven; Louis Geghter, trading as Elm City Leather Co., New Haven; New Haven Leather Co., Inc., New Haven; Puzzo Bros. Co., Waterbury; Rochina and Anthony M. DeCroce, copartners trading as Torrington Leather Co., Torrington; and Zich Leather Co., Hartford.

Manufacturers who also are associate members of the Connecticut Association are Cat's Paw Rubber Co., Inc., Baltimore; Essex Rubber Co.; Goodyear Tire & Rubber Co.; Holtite Co.; I. T. S. Co.; O'Sullivan Rubber Co., Inc.; Panther-Panco Rubber Co., and United States Rubber Co.

The respondents have been granted 20 days to answer the complaint.

The Natural Rubber Situation

Although imports of natural rubber during May dropped to a little over 6,000 tons, as compared with almost 20,000 tons in April, by virtue of a stockpile of 171,000 tons and an assured importation of 150,000 tons during the second half of 1946 at the new 23½¢-a-pound price, the CPA increased the amount of natural rubber allocated to the industry to about 32,000 tons a month for the third quarter. This figure represents an increase in the percentage of natural to total rubber consumed of from 20 to 40%. Natural rubber permitted in truck tires now ranges beween 65 and 94% and in passenger-car tires is raised to 13%. Appropriate increases in the natural rubber content of many other rubber products were also allowed. Consumption of natural rubber during May was about 18,000 tons.

In this connection, in addition to the compounding and processing problems of this reconversion to greater amounts of natural rubber in the industry's products, is the problem of increased cost of this raw material. It is understood that the higher price being paid for imported natural rubber will be passed on to the consumer, since the elimination of subsidy payments for Far Eastern rubber as a consequence of the new OPA Bill is considered likely. The price of Far Eastern rubber from July 1 on, of 23½¢ a pound at ports in the producing areas, means a price of at least 25½¢ a pound, delivered in New York. Since the present fixed government price is 22½¢ pound, a considerable financial loss to the government is indicated unless this price is passed on to the consumer.

However in a letter to the industry, dated July 26, the RFC stated that although this agency had contemplated increasing its selling price to 26¢ a pound, at a recent meeting in Washington called by the president of the RMA, representatives of the industry had requested a delay in the price increase to provide an opportunity for further consideration and discussion. Therefore during July natural rubber was to be billed at 22½¢ a pound, with the understanding that if a price increase was decided upon, it would be retroactive to July 1, but would in no case be more than 26¢ a pound. It is understood that the industry is strongly recommending that the present 22½¢ a pound price be retained until January 1, 1947, since although RFC will lose money on the 150,000 tons of natural rubber involved, costs of GR-S have been and will probably continue to be sufficiently below the 18½¢-a-pound selling price here to more than make up the loss suffered by RFC on natural rubber and still provide a sizable margin of profit on RFC's operations in both natural and synthetic rubber.

A report from Batavia, dated July 7, (ANETA), stated that the restoration of some 50,000 acres of rubber plantations between Batavia and Buitenzorg, is well under way under the direction of the Netherlands Indies Rubber Fund. Experts predicted that the trees would yield about 900 pounds per acre per year because of the long rest the trees had during the Japanese occupation and up to the present time.

The reconstruction work on some of the plantations is so far advanced, it is expected that tapping will start soon on them; while virtually all the plantations in the area are expected to be working at full capacity by the end of the year, this report said.

Another report from Belem, Brazil, by John A. Thale of the Chicago Daily News Foreign Service, stated that by the end of

June the Rubber Development Corp. offices in Rio de Janeiro and the upper Amazon city of Manaos will be closed and the main office, in Belem, probably will be closed about September 1.

It was also reported that RDC officials and private rubber experts doubt that the money spent by the United States in Brazil during the past four years to increase natural rubber production will have any permanent effect.

Brazil has benefitted, however, in that many items of equipment such as tractors, Diesel engines, trucks, tools, etc., were disposed of by RDC to the Brazilian Government. American officials were reported as satisfied with the return on the investment obtained from the sale.

Congress Approves Disposal of Some Plants

Following the report of the War Assets Administration, made public on June 10 and dealing with the disposal of GR-I (Butyl) and GR-M (neoprene) synthetic rubber plants, five styrene plants, one furfural plant, and six carbon black plants, and the interim report of the Inter-Agency Policy Committee on Rubber, made public on June 13 and recommending the disposal of some of the high-cost or "fringe" GR-S plants, the Senate on July 11 passed a resolution recommending that, "notwithstanding the provisions of section 19 of the Surplus Property Act, no synthetic rubber plants costing the government in excess of $5,000,000 be disposed of until six months after submission to Congress of a report and recommendations by the Director of War Mobilization and Reconversion with respect to the establishment of a comprehensive national rubber program." The styrene, furfural, and carbon black plants, two alcohol-butadiene plants, and copolymer plants not to exceed 20% of the total capacity of all government copolymer plants were, however, exempted from this resolution.

The resolution failed of adoption when a Pennsylvania representative blocked its passage when he couldn't attach a rider to it to prevent the disposal of government-owned oil pipe lines. It is understood that the WAA plans to be guided by the policy indicated in the resolution until such time as Congress receives the final report of the Inter-Agency Policy Committee on Rubber and then defines by legislation the final policy. This was confirmed by the fact that the abovementioned exempt plants were offered for sale or lease during July and one GR-S copolymer plant at Louisville, Ky., was sold to The B. F. Goodrich Co.

The Inter-Agency Policy Committee on Rubber, in turn, again moved rapidly and released on July 29 its final report on the disposal of the remaining government plants and the formulation of a long-range government policy on rubber.

Some Details of Senate Action

The *Congressional Record* for July 11, besides the resolution mentioned above, contains some information included in a report by the Senate Military Affairs Committee on the disposal program for synthetic rubber plants. This report, after reviewing the actions taken to date by the WAA and the Inter-Agency Policy Committee on Rubber, then states as follows:

"Your committee holds that Congress would not be fulfilling its obligations to the people if it permitted disposition to proceed without full knowledge of the plan for such disposition.

"The Committee on Expenditures in the Executive Departments, which reported the Surplus Property Bill in the House of Representatives, stated with respect to synthetic rubber and aluminum plants as follows:

"'In both those cases, not only does the Government own an overwhelming preponderance of the total productive capacity of the country, but other factors of national and international importance as distinguished from sectional or vocational importance place them in a class where national interest requires a complete examination by Congress of any disposal plan.'

"There are additional reasons why Congress at this time should not authorize War Assets Administration to proceed with disposal of Government-owned synthetic rubber plants, which are to form the basis for a future privately owned synthetic rubber industry.

"First of all, the disposal program for the copolymer and butadiene plants which constitute the bulk of the investment in Government-owned synthetic rubber facilities calls for a cut-off date for bids at the earliest by the end of 1946. Thus the proposed program itself indicates that there is no immediate urgency to proceed with the disposal of the basic synthetic rubber plants.

"Secondly, the reports stress the importance for some time to come of uninterrupted operation of the majority of the Government-owned synthetic rubber facilities. Since interruptions cannot well be avoided in case of change of operators, it seems desirable to postpone disposal of the basic plants until a future date when a changeover to other operators, can, if desirable, be effected without damage to the national economy and the national security.

"Third, the reports indicate that several agreements between the Government and present operators of synthetic rubber plants contain restrictive provisions with respect to disposal of these plants which are contrary to the objectives set forth in the Surplus Property Act. Furthermore, the present patent picture is rather complex and will render it difficult for companies other than the present operators to bid on these plants. Time will be required for the study of these situations with a view to negotiating, if possible, agreements with present operators which will permit other companies who desire to acquire these plants to operate them in fair competition with the present operators.

"The fact that Congress desires further to study the disposal of the basic synthetic rubber plants should not by any means be construed as an indication that Congress is opposed to transfer to private ownership of the synthetic rubber industry. On the contrary, the Congress desires to encourage the establishment at the earliest possible date compatible with the national security of a privately owned competitive synthetic rubber industry. Therefore, it views with approval the suggestion made by the Director of War Mobilization and Reconversion that exploratory negotiations promptly be initiated with all parties interested in the acquisition of the basic synthetic rubber plants."

Another action by the Senate in connection with the problem of plant disposal has been the action by certain Senators in preparing an amendment to the so-called Surplus Crop Policy Bill. This amendment would extend the Bill to cover government-owned industrial alcohol and alcohol-butadiene plants. The sponsors of the bill, which calls for use of surplus government-owned plants in a program to dispose of future grain or other food surpluses, are Fullbright of Arkansas, Butler of Nebraska, and George of Georgia. In the House a similar bill is being sponsored by Anton J. Johnson of Illinois.

It was announced from Washington on July 30 that the House Ways and Means Committee unanimously approved a bill prohibiting the sale of three government-owned industrial alcohol plants and one butadiene plant, pending establishment of a permanent national rubber policy. This legislation which, the report said, had already been passed by the Senate, also continues to December 31, 1947, the authority of government industrial alcohol plants to manufacture sugars and industrial sugar syrups.

The bill provides that, until an overall rubber policy is written, the government cannot dispose of industrial alcohol plants at Omaha, Neb., Kansas City, Mo., and Muscatine, Iowa, and it must retain one of the three butadiene plants located at Kobuta, Pa., Louisville, Ky., and Institute, W. Va.

The Second Batt Report

The Second Report of the Inter-Agency Policy Committee on Rubber of the Office of War Mobilization and Reconversion, the chairman of which is William L. Batt, was made public July 29. Included with this report was a letter of transmittal from Mr. Batt to John R. Steelman, Director of the OWMR, and a joint letter from Mr. Steelman to President Truman, the President of the Senate, and the Speaker of the House of Representatives, all dated July 22.

Mr. Batt, in his letter, reviewed the issuance of previous reports by his committee, calling special attention to the interim report of June 13, 1946, and stated that the material in this interim report was also to be found in the second report. Mr. Batt then continued:

"By setting forth its thinking on the terms and methods of plant disposal and revisions of existing patent and information exchange agreements, the Committee believes that Government and private industry will be able to proceed in an orderly manner with disposal of Government-owned synthetic rubber facilities.

"Your attention is particularly directed to Part IV of this report in which the Committee recommends that Congress declare as essential to the national security of the United States, the maintenance of a synthetic rubber industry whose production will be continuously used. It further recommends that the Congress be asked to establish a national rubber supervisory body to supervise and coordinate all Governmental activities relating to the national rubber policy. In the ensuing months, the Committee proposes to

prepare drafts of this recommended legislation for submission to you to the appropriate Congressional committees at the beginning of the next session of Congress."

Mr. Batt then went on to recommend that this report be forwarded to the President of the United States, the President of the Senate, and the Speaker of the House before Congress adjourns, in order that members of Congress shall have full opportunity to study the recommendations of the Committee during the coming recess.

Mr. Steelman in his letter to these top government executives, emphasized that the present report contained a detailed discussion of research and development problems as well as recommendations for legislation, the enactment of which appeared to him to be highly desirable in the public interest.

Research and Development

This part of the report started off by saying that since the issuance of its First Report, the Committee has made further inquiries in the research field and has consulted at length with representatives of government-sponsored research programs, with university scientists, and with research directors of rubber, petroleum, and chemical companies. It continues to be impressed with the necessity of supplying all possible incentives to the future conduct of research in the rubber field so that the objective may be attained of maintaining without artificial support a synthetic rubber industry adequate for national security, the report adds.

"For the long-run period in which private industry would operate the synthetic rubber facilities of the nation, the emphasis in research programs needs to be shifted from improving production and processing techniques involving already known types of synthetic to discovering and developing new and better types of synthetic rubber.

"Active and vigorous research is most necessary if synthetic rubbers, able to compete with natural rubber in a free market, are to be developed. In order to add the competitive forces of private industry to the attainment of this objective, the Committee believes that the synthetic rubber industry should be transferred to private hands as rapidly as possible.

"Simultaneous with disposal of the bulk of our usable synthetic rubber capacity, existing agreements relating to the exchange of technical information on new discoveries should be terminated, and at the earliest practicable moment the Government should retire from the manufacture and sale of synthetic rubber. At the time of disposal, most synthetic rubber research should become the responsibility of private industry. The Government should continue making such grants in aid to universities or other research agencies as it deems advisable for the initiation or continuance of fundamental long-range polymer research referred to in Part 5 (b), page 39, of the Committee's First Report. The Government should also continue to maintain its evaluation laboratory and associated pilot plant at Akron, O. It should promptly make publicly available information on Government-sponsored research. However, its facilities should continue to be available on a fee basis to small companies lacking adequate testing facilities."

The present report next discusses the agreements entered into during the war period with various chemical, petroleum, and rubber companies regarding technical data and patent rights in the butadiene, styrene, and copolymerization fields and stated that these agreements provide a basis for the cooperation of the participating companies in the development of improved processes and products and are indispensable in minimizing the Government's liability for infringement of patents.

"It is, nevertheless, the consensus of the Committee that its recommended program of creating competitive conditions within the industry conducive to the maximum of research may be impeded by the continued technical information exchange and patent cross-licensing provisions of these agreements as to new developments. To the extent that the present agreements prevent private enterprise from enjoying exclusively the fruits of its future research under the protection of the patent system, they may restrain competitive operation of the industry and inhibit the development of new processes and new polymers. On the other hand, caution must be exercised not to lessen the Government's protection against patent litigation during the remaining period in which plants are operating for the account of the Government in its Synthetic Rubber Program."

In addition to the four basic patent agreements with Goodyear Tire & Rubber Co., The B. F. Goodrich Co., Firestone Tire & Rubber Co., and United States Rubber Co., together with the Standard Oil Development Co. and Hycar Chemical Co., Rubber Reserve Co. is a party to bilateral cross-licensing agreements with 38 commercial companies covering the exchange of royalty-free patent rights and technical information in the copolymer field. Parties signatory to this series of bilateral agreements (collectively known as the Cross-License Agreement) are presently considering March 2, 1946, as the cut-off date for the exchange of all patent rights and technical information thereafter acquired, the report points out.

"Qualified technical experts in the field of synthetic rubber research have advised the Committee that the exchange of information required by the Government-sponsored patent agreements will retard the search for new polymers. . . .

"The Committee recommends that the patent agreements in the styrene and butadiene fields be terminated as to future discoveries of each signatory when such signatory acquires a Government plant or when its operating agreement is terminated, whichever is the earlier. Alternatively, a uniform cut-off date might be agreed upon similar to that recommended below in the case of the copolymer plants. These steps should be taken without increase in the payments by Rubber Reserve of amounts to cover royalties under the butadiene and styrene agreements and without diminution of the immunities secured for the Government by virtue of such payments.

"The Committee recognizes that any solution to the problem presented by the patent agreements as to future discoveries in the copolymer field will have certain disadvantages. It believes, however, that the least undesirable policy would be to terminate the provisions of these agreements relating to new discoveries as to all signatories on a uniformly applicable cut-off date. It would seem most appropriate that the uniform cut-off date be made to coincide with the time at which this basic block of plants is disposed of.

"To carry out the Committee's recommendation in the styrene, butadiene and copolymer fields will obviously necessitate some alteration of the existing agreements. The Committee recommends that the various signatories undertake such alterations, which would seem to be to the advantage of all concerned."

The report explains that at the time the present patent agreements were negotiated, assurance was sought against the possibility that their execution might involve the signatories concerned in litigation under the anti-trust laws. The fact that the synthetic rubber program was to be supervised and directed by the government and that the agreements were essential to the effectiveness of the defense program led the Department of Justice to give clearance to the agreements; the same considerations subsequently made them eligible for certification by the Chairman of the War Production Board as requisite to the prosecution of the war in accordance with the terms of Section 12, Public Law 603, 77th Congress. This legislation provides immunity from anti-trust prosecution for acts covered by the certification.

It is the position of the Department of Justice that with the transition to a normal peacetime economy and a less critical rubber position, the time will arrive for termination of the certificates applicable to these patent pools. At that time the Department indicates that it may wish to inquire into the question of legality of continued performance under the patent pooling agreements, if they have not previously been terminated.

A letter from the chairman of the Reconstruction Finance Corp., Charles B. Henderson, bearing on the above point, is attached to the report. This letter states in part:

"This Corporation is in full accord with the general objective that the rubber program under Government operation be terminated as expeditiously as is commensurate with national security and the Nation's reconversion effort. If, however, private enterprise does not assume the responsibility of acquiring sufficient plant capacity to meet in full the Nation's synthetic rubber requirements and if the Government thus finds itself in a competitive position as a producer of synthetic rubber, a policy should be adopted which will assure both efficient operation of Government-owned facilities and the equitable distribution to the entire industry of such synthetic rubber as may be competitively produced.

"This Corporation is fully cognizant of the desirable effect of now placing the several companies in the Government program in a competitive position with each other as to new developments resulting from privately financed research. Reconstruction Finance Corp. has no objection to any amendment of the patent and technical exchange agreements to which it is a party, insofar as the adjustment of relationships between the commercial parties will be effected. This Corporation, however, is opposed to any modifications of such agreements which may restrict the operations of Government, reduce the licensing rights and technical information which can be made available to purchasers of the plants, or limit the quality improvement or output of Government produced rubber and thus discriminate against the many consumers of such rubber.

"It should be pointed out that this Corporation is unwilling to accept any implication that the parties signatory to the

several exchange agreements must modify such agreements in accordance with the recommendations of the Committee in order to establish their legality. At the time the respective agreements were negotiated assurance was sought against the possibility that their execution might involve the signatories concerned in litigation under the anti-trust laws. The Attorney General was accordingly requested to give his opinion as to whether each of the respective agreements would be regarded by the Department of Justice as constituting a violation of the anti-trust laws. The Attorney General gave his opinion that the respective agreements do not constitute such a violation, but it was the position of the Department of Justice that the Department reserves complete freedom to institute civil actions under the anti-trust laws to enjoin the continuing of any acts or practices by the respective parties to the several agreements which are found not to be in the public interest and which are persisted in after notice to desist."

Government Purchasing and Pricing of Synthetic Rubber

Under present conditions it has been regarded as essential that the maximum possible production of synthetic rubber be achieved even to the extent of government operation of conspicuously high-cost plants. Government ownership has involved the closest integration of all elements of the producing industry, and the necessity of equitable division among manufacturers of a critically scarce commodity has required government distribution of synthetic rubber supplies, the Batt report states and then emphasizes that:

"The Committee urges that the pattern of disposal be such as to assure the small rubber user of access to synthetic rubber supplies under reasonable price and other purchase conditions.

"When private companies acquire the basic block of plant capacity previously referred to, the Committee believes that they should not be compelled to sell their output to the Government, but should be free to find their own market outlets subject only to such general price or other controls, if any, as are in existence. A company purchasing a plant before such time should be required to sell its output to the Government until disposal of the basic block of plants."

A portion of a letter from the chairman of the RFC, on the pricing of synthetic rubber takes a somewhat different attitude:

"If there is a coextensive synthetic rubber production by private industry and Government, certain companies which have financial resources sufficient to incur the risks of plant acquisition in this new industry may then be operating the low cost producing plants, leaving the higher cost producing plants for operation by the Government. Under such circumstances, if the Government sells its rubber at cost, it is probable that undue advantage would accrue to the private owners of the low-cost plants to the detriment of the many small rubber consumers who may be forced to purchase their requirements from the Government plants. On the other hand, if the Government should sell its rubber at less than cost in order to supply the small rubber consumers with their requirements at a competitive cost, a subsidy of federal funds would result which might not be uniformly applicable to the entire industry. In order to avoid such inequities, it is the position of this Corporation that so long as it may be required to operate synthetic rubber plants in competition with private industry, preclusive Government purchase of synthetic rubber of types similar to that produced by the Government should be authorized at mutually agreeable prices in order that such synthetic rubber may be made available to the entire fabricating industry at a uniform sales price."

Considerations as to the general level of prices and the continued existence of governmental controls are not foreseeable by the Committee at this time, and it can now do no more than express the general judgment that once plants are privately owned they should operate as private enterprises at the earliest possible moment.

"Such privately-owned plants will have a vital interest in the manner in which Government may conduct its part of the business, if it is still of necessity operating some of the plants in the synthetic rubber industry. Such operation should, in the Committee's opinion, be of as short duration as possible, should not be looked upon as a yardstick for private operators and should recognize in the basis of pricing the usual capital charges such as depreciation, amortization, etc., for plants operated. Its prices should not include costs of maintaining plants in stand-by condition. This would necessitate a program to be approved by Congress respecting the financing of and responsibility of physical maintenance of stand-by facilities or other exceptional charges."

Government Purchase of Natural Rubber

The report calls attention to the fact that the purchase of natural rubber since V-J Day from reoccupied areas in the Far East has been greatly complicated by political and other difficulties. It is the belief of the Committee that during the period when natural rubber is in critically short supply, the control of its purchase by government and its allocation through inter-governmental machinery most effectively meet the natural rubber needs of the United States. The Committee feels, however, that these controls should be dispensed with at as early a date as practicable.

National Rubber Supervisory Body

Since the Second War Powers Act has recently been extended by Congress until March 31, 1947, allocation, specification control, and priority assistance in the rubber field will continue during a substantial part of the period of critically short supply of natural rubber. If it appears that rubber will continue in short supply after March 31, 1947, a temporary extension of the necessary powers should be accorded, the report recommends.

On the subject of national rubber policy and a national supervisory body, the report has the following to say:

"It is highly important that the broad lines of national rubber policy be determined authoritatively now while the critical nature of the country's rubber position is still present in the public mind. It is also desirable that prospective purchasers of synthetic rubber plants be given reasonable assurance of Government support if such support should prove to be necessary. Furthermore, there is a strong need for the type of national rubber supervision recommended in the Committee's First Report, to coordinate the activities of the various governmental agencies in the rubber field in the interest of a continuously coherent national rubber policy. Such a supervisory body should attempt to foresee and be ready to deal effectively with any rubber emergency.

"To this end, the Committee now recommends that the Congress declare as essential to the national security of the United States, the maintenance of a synthetic rubber industry whose production will be continuously used. The desired size of such industry has already been indicated in the First Report. To implement this policy, the Congress should further be asked to establish a national rubber supervisory body to supervise all activities of all Government agencies insofar as they are concerned with national rubber policy. This body should be directed to keep the country's rubber position under continuous review and to make periodic reports to the President and the Congress. When and if it should appear to the supervisory body that there is any danger of synthetic rubber consumption falling below security requirements, it should be its duty so to report to the President and the Congress, together with specific legislative recommendations for the necessary means of Government support."

Other duties of the national supervisory body indicated were: the direction of government sponsored research in the synthetic rubber field; the formulation of recommendations regarding the rate of acquisition of the national strategic stockpile of natural rubber; and when the operations of the Office of Rubber Reserve terminate, the assuming of responsibility for recommendations looking to adequate maintenance and security of government-owned synthetic rubber plants held in stand-by condition, and for passing on possible recapture and other clauses incident to plants disposed of.

The body should consist of a high-ranking officer of each government department or agency having substantial responsibility in the rubber field, together with an independent chairman to be appointed for a term of years, and the body should utilize expert knowledge through appropriate advisory groups, it is stated.

"It is desirable that legislation setting up the proposed rubber supervisory body be enacted some time before June 30, 1947, since the War Mobilization and Reconversion Act, under which the present Inter-Agency Policy Committee on Rubber derives its authority, is due to expire on that date," the report points out in this connection.

Possible Methods of Government Support

It is stated that the Committee has devoted much time and thought to examining various possible methods whereby synthetic rubber could, if necessary, be granted government support. Although the most satisfactory form of government support can best be determined in the light of domestic conditions and international commitments as they exist at the time such support may prove necessary, much of the ground covered by this Committee will be applicable to most foreseeable conditions.

As was pointed out in the Committee's First Report, the reclaim industry makes a vitally important contribution to our rubber supplies. The Committee assumes that, in considering the form of support it might wish to give synthetic rubber, Congress will take into account the legitimate claim of the reclaim industry not to have its products unduly discriminated against. At the same time it is

desirable that no form of support unduly impair the relative competitive position of any particular type of synthetic rubber.

Possible methods of support considered by the Committee in some detail included tariff protection, import quotas, excise tax, import monopoly, a certificate plan, an industry code, a subsidy, and product specifications. The Committee then concluded that:

"If it were necessary to make a decision today on the best method of governmental support, the Committee would favor use of product specification or subsidy, or a combination of both, to the exclusion of other methods. The majority of the Committee would lean toward a combination of both.

"Certainly, during the short-run when rubber is in critical supply and while its use is being controlled under the Second War Powers Act or any extension thereof, there is no need to make a decision concerning Government support. It is the view of the committee that it is not necessary at this time to recommend a particular type of support for the long range, since it would be unwise to enact such legislation until future circumstances demonstrate that synthetic rubber cannot compete with imported natural rubber. Nevertheless, developments in the rubber field often move at a rapid pace, and the need for Congressional action, if and when it arises, may be urgent," the report states.

Miscellaneous Surplus Disposal News

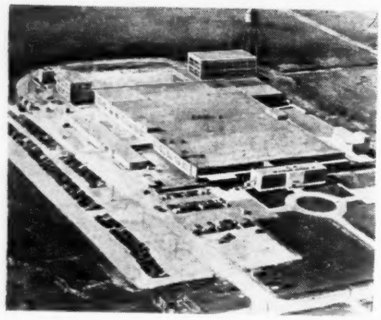
A government-owned aircraft assembly and manufacturing plant, leased and operated during the war by Goodyear Aircraft Corp. on the southern side of the Akron Municipal Airport, was offered for sale or lease by the WAA on June 24. The plant has a reported wartime construction cost to the government of $12,334,865.

A portion of the Port Neches, Tex., butadiene plant, leased and operated during the war by the Neches Butane Products Co., was offered for sale or lease by WAA on June 25. The complete plant is part of the Rubber Reserve program, but the portion offered has been released for disposal. This portion was used for fabricating various types of vessels used in the distillation and processing of butane, and the total government investment in buildings, machinery, and equipment was about $1,000,000.

In connection with the report last month that the Seiberling Rubber Co. had negotiated a five-year lease of the plant at Garland, Tex., formerly operated by Continental Motors Corp., with an option to buy the plant at the end of the five-year period, J. P. Seiberling, president of the rubber company, made a statement as follows:

"The acquisition by Seiberling Rubber Co. of the former Continental Motors war plant at Garland, Dallas County, Texas, is the first step of a $4,000,000 program to further expand Seiberling Rubber Co.'s tire and tube productive capacity made necessary by the increasing popularity of Seiberling-manufactured product and the insistent demand of independent tire dealers everywhere for enlargement of Seiberling Rubber Co.'s manufacturing facilities to the point where they are adequate to care for the requirements of independent tire dealers.

"The plant at Garland, Texas, contains approximately 260,000 square feet of floor space. Necessary alterations of buildings and installation of approximately $3,000,000 of the newest and finest type of rubber manufacturing machinery will begin immediately, with expectation that the plant will be ready for operation in 12 to 14 months. It is anticipated that the plant will furnish employment to approximately 800 people and have a productive capacity in excess of 600,000 tires and tubes per annum, in addition to other rubber products."



Air View of New Seiberling Plant at Garland, Tex.

A Memphis, Tenn., plant formerly operated by the Quaker Oats Chemical Co. was offered for sale or lease on July 1. This plant, designed to produce furfural in connection with the synthetic rubber program has an annual rated capacity of 24,000,000 pounds. The facility will be disposed of subject to the requirements of the Office of Rubber Reserve, RFC.

Monsanto Chemical Co. on July 3 announced the lease of a government-owned chemical warfare service plant at Monsanto, Ill., for the purpose of manufacturing a series of peacetime products which have been under research study or process development. Company officials said they would spend approximately $1,000,000 on alterations and additions to the plant. The lease, company officials also said, specifies that Monsanto will keep the plant equipment intact and will ready the plant for wartime operation in case of a national emergency.

Resistoflex Corp. has purchased the plant it operated in Belleville, N. J., for the production of aviation and automotive hose for $55,000. The company will continue the same type of hose manufacture, employing approximately three hundred persons.

The Kobuta, Pa., plant for the production of styrene for GR-S, leased and operated during the war by Koppers Co., was offered for sale or lease on July 9. The plant had a reported cost to the government of $60,000,000 and a rated yearly capacity of 80,000 short tons of butadiene and 375,000 short tons of styrene, but only the portion used for the production of styrene is being offered for sale or lease at this time.

Also offered for sale or lease on July 9 were the Texas City, Tex., plant, leased and operated during the war by Monsanto, which has a reported cost to the government of $18,000,000 and a yearly capacity of 50,000 short tons of styrene and 2,000 short tons of toluene; the Velasco, Tex., plant, leased and operated during the war by Dow Chemical Co., which has a reported cost to the government of $18,000,000 and a rated yearly capacity of 50,000 short tons of styrene; and the Los Angeles, Calif., plant for the production of styrene, which Dow also operated during the war, which reportedly cost the government $12,000,000 and which has a rated annual capacity of 25,000 short tons.

Purchase of the rayon cord fabric plant it previously operated for the government in Decatur, Ala., was announced by the Goodyear Tire & Rubber Co. last month. The land, building, complete equipment and machinery were included in the transaction, according to Cliff Slusser, company vice president. The purchase price was $956,720. Among the recent improvements was the installation of air-conditioning equipment at a reported cost of quarter of a million dollars. Upward of 150 persons comprise the plant's personnel, which is expected to reach 200 when additional rayon is available.

The GR-S synthetic rubber plant in Louisville, Ky., leased and operated during the war by The B. F. Goodrich Co., has been purchased by that company for $4,250,000, it was announced on July 22. This plant had a total reported cost to the government of $10,719,097, and has a rated capacity of 60,000 long tons per year. Goodrich expects to use this plant for the continued production of synthetic rubber and Geon (polyvinyl chloride resin.) This sale is the first among the plants used in the government's wartime synthetic rubber program.

Management - Labor Relations News

In general, management-labor relations continued good in the industry during July, except for the strike which closed down the three plants of the General Tire & Rubber Co. at Akron, O., Jeanette, Pa., and Waco, Tex. There was a certain amount of uncertainty regarding the possible action that might be taken by organized labor if some sort of OPA was not restored, but with the passage of the bill extending the OPA until June 30, 1947, no more was heard on this subject. The policy for the U.R.W.A. for the next 12 months will be formulated at the national convention of this union scheduled for San Francisco in September. Seiberling Tire & Rubber Co., Barberton, O., signed a new contract with the local U.R.W.A. union late in June after two weeks of negotiations. On July 11 the Joseph Stokes Rubber Co., Trenton, N. J., announced that it was closing down its plant and going out of business after an 11 weeks' strike since the demands of the local U.R.W.A. union at that plant "gave us no other alternative," according to Walter Harvey, president of the company.

The General Tire Strike

As announced last month, General Tire plants at Akron, Jeanette, and Waco were closed during the week of June 17 by strikes at the three plants. At Akron and Jeanette the company and the local union were unable to negotiate a new contract, and at Waco, the dispute was primarily over wages. At Akron, Paul W. Fuller, U. S. Labor Department conciliator, tried unsuccessfully to get the U.R.W.A. local union representatives and

company officials together to discuss the issues. Late in July, L. S. Buckmaster, president of the international U.R.W.A., conferred with representatives of the three local unions involved in order to formulate some plan for settlement of the strikes and present it to the company.

It is understood that the several problems in this controversy that have caused these General plants to remain strike-bound since June 21 are: (1) the company has refused to bargain on a company-wide basis and will only negotiate at the plant level, (2) the U.R.W.A. union insists on Company-wide bargaining, and (3) at Akron, picketing prevents company officials and non-union workers from entering the plant, and W. O'Neil, president of the company, will not negotiate unless he can do so at his regular place of business, the Akron plant.

Meanwhile General Tire management and many office workers have been conducting business in space secured in downtown Akron office buildings and hotels.

In an eight-page folder received by company employes while out on strike, Mr. O'Neil pointed out that the only way to stop shortages, bring prices in line, and beat black marketeers is to produce more goods. In connection with the pamphlet, company spokesman stated that it had been written and the mailing date set before there was any strike threat. The booklet, second in a series, is aimed at clearing up misunderstandings on basic economic problems. Some excerpts from the publication follow:

"Whenever strikes occur, less goods are produced and prices go up more than enough to offset the increased wages gained as proved again by the several price increases granted automobile manufacturers.

"We believe that it is the right of every American to fight for what he thinks is right. No group has authority to deny this right, but management, labor and government agree that only through production can we lick shortages, high prices and black markets.

"The American worker is a free man with intelligence and ambition. We feel it is high time for American management to combat poisonous European propaganda with plain, unbiased American truths.

"Whether you agree or disagree with our thinking is immaterial. What is important is that you think for yourselves . . . for only when we all think about these problems can we find the right answer for all."

The pamphlet deals with the "Adventures of Albert in Nothing Land," where there are no cars for sale, no suits for sale, and no houses for rent. Albert is described as a typical American, one of General Tire's workers, who "makes more money per hour than workers in any comparable industry," but who finds nothing but higher prices.

Seiberling Signs New Contract

In a statement from the Seiberling Rubber Co., Barberton, O. late in June, it was pointed out that the company and Local No. 18, U.R.W.A., continued to hold a 100% no-strike record with the signing of a new contract between the company and the union. It is understood that the local union rescinded its strike vote taken on May 15 and voted almost unanimously to accept its bargaining committee's recommendations for accepting the new contract.

In the settlement of wage negotiations, the company granted a general wage increase of 6½¢ an hour to all the time-card employes of the plant at Barberton, made retroactive to March 4, 1946, and also agreed to leave intact the additional 3¢-an-hour night-shift bonus granted employes some time ago. The company had also previously granted a general wage increase of 12¢ an hour. Besides the general wage increase now totaling 18½¢ an hour, the company has agreed to make intraplant rate adjustments in addition to those made at the time of the 12¢ an hour increase in January, 1946. These adjustments are equivalent to about 4¢ an hour across the board to all employes, it was said.

Harry P. Schrank, vice president in charge of production, praised the efforts of both the local union and company representatives for their bargain table actions.

"It is truly significant since this year we are celebrating the twenty-fifth year of this company's existence," Mr. Schrank said. "It was 25 years ago that F. A. and C. W. Seiberling founded Seiberling Rubber Co. and I believe that the human relations that they practiced when this industry was organized in 1921 have helped make good, sound labor relations, which both the union and company can well be proud of."

Stokes Closes Plant

The Joseph Stokes Rubber Co., Trenton, announced July 15 that it was going out of business because an 11-week strike of 650 production workers "'gives us no other alternative." The company, established in Trenton nearly 50 years ago, recently became an affiliate of The Thermoid Co.

Members of local No. 114, U.R.W.A., went on strike April 24 for a straight 18½¢ an hour increase in wages and other contract changes. The company offered 18½¢ an hour for employes working 40 hours a week and 13¢ an hour for those in departments working 48 hours.

In a statement to its customers, the company said in part:

"On Thursday, July 1, the Board of Directors of Joseph Stokes Rubber Co. voted to liquidate and sell its assets. The company believed firmly that it had made a fair offer to the C.I.O.; however, this offer was refused, and the directors with regret took the above action."

Miscellaneous Stoppages, Etc.

The walk-out at the Firestone Tire & Rubber Co.'s Plant 1 in Akron, on June 17 by about 125 men over a new wage rate resulted in a shutdown of Plant 1 and the government-owned synthetic rubber plant adjoining this Firestone plant. The workers at Plant 1 returned to work on June 21 at the direction of local union officials. Workers at the synthetic rubber plant returned to work on June 22.

In connection with the Plant 1 walk-out, local union officials stated that the company had agreed to restore the 13¢-an-hour reduction in wages of compound room checkers after a conference between the company and the union. The company explained that it had not cut the hourly rate, but had merely removed supervision authority from the checkers, thereby automatically reducing their hourly rate, but that now some pay adjustments would be made by providing additional duties to the checkers.

The workers at the synthetic rubber plant had protested working conditions, claiming that the company added more work on the synthetic production lines. They returned to work pending negotiations which began on June 20.

A one-day strike of 3,200 workers at the Manhattan Division, Raybestos-Manhattan, Inc., Passaic, N. J. the first general strike in the company's 53 years of operation, occurred on July 11. The strike was called in protest of a disciplinary layoff of a worker who admitted being absent from work for an hour and a half, although his time card showed he was on the job. The independent union at the plant took the position that the worker should merely have been warned. The union voted to return to work when a U. S. Labor Department conciliator said he would not consider the case until the men returned to work.

The nine-week strike of 1,200 employes of the American Hard Rubber Co. plant at Butler, N. J., which was settled on July 10 and resumed again on July 15, was settled again on July 17 after a conference between company and union officials.

The B. F. Goodrich Co. and the Foreman's Association of America were involved in a dispute before a trial judge of the NLRB at Akron, on July 17. Chapter 98, FAA, presented charges that the company refuses to recognize it as sole bargaining agent for the 775 foremen at the Akron plant of this company. Goodrich, however, has taken the position that the NLRB went beyond its authority in certifying the FAA as a collective bargaining agent for Goodrich foremen. A suit is now pending in a district federal court on the question whether a company must recognize and bargain with foremen's associations. The NLRB trial judge adjourned the case after a short hearing until he reviewed the testimony at hearings involving the Westinghouse Electric Co.

A walkout of 23 men at the Goodyear Tire & Rubber Co. in Akron on July 19 curtailed production in the Plant 3 division producing Airfoam. Goodyear reported it had suspended the 23 men for violation of contract. The workers are protesting piecework rates in effect for two weeks. The local union president was reported investigating the dispute.

California Rubber Products, Inc., 130 N. Hawthorne Blvd., Hawthorne, Calif., in its recent reorganization elected the following executives for the ensuing year: W. E. Shawger, president and general manager; Gaines Hon, vice president; John W. Hoekstra, secretary; Viola Burger, treasurer; James F. Daniel, assistant secretary and assistant treasurer; Mr. Shawger, Frank W. Russell, R. W. English, and Mr. Daniel, board of directors. The company makes molded mechanical rubber goods and sponge rubber products.

Westinghouse Electric International Co., Pittsburgh, Pa., has announced the election of Wm. E. Knox as president and general manager to succeed John W. White, who resigned to become director general of Industria Electrica de Mexico. Mr. Knox, who first served as a sales clerk with the company 24 years ago, has been vice president of the International company since March, 1944, and before that was assistant general manager

More Natural Rubber Available for Rubber Products

Items ranging from conveyer belting to surgical tape will be made with more natural rubber because of the additional 12,000 long tons of natural rubber to be allocated in the second half of 1946, W. James Sears, director of the CPA Rubber Division, announced July 9. Moving to alleviate the demand for GR-S, CPA is making the additional allocation of natural rubber available at the rate of 2,000 long tons a month for use in other than transportation items. The percentage of natural rubber permitted has been increased in a substantial number of rubber products, and quite a few articles previously limited to synthetic rubber may now use a specified amount of natural rubber.

"These steps were taken to conserve the consumption of GR-S, which has become scarce because grain and molasses are necessary to alleviate starvation in many countries, hence are not available as raw materials to produce industrial alcohol which in turn is converted to butadiene (the principal ingredient of GR-S)," Mr. Sears explained.

"The plants making butadiene from petroleum are being operated at maximum capacity and will continue at this rate for many months to come," Mr. Sears added.

Amendment 3 to R-1, effective July 9, authorizes natural rubber in increased amounts by amending Table B (Permitted Products) of Appendix I. Some changes are:

Ten per cent. more natural rubber to a maximum of 35% will be allowed in conveyer and elevator belting and pulley lagging.

Natural rubber may now be used in V-belts as desired, in comparison with the previous allowance of 12 to 18%.

Rubber industrial hoses of various types receive substantial increases.

Contoured automotive floor mats, previously a non-permitted item, may be made with 10% natural rubber.

Print blankets for textile printing, formerly permitted no natural rubber, will be allowed any amount desired.

Surgical tape and adhesive bandage will be made with 25% natural rubber, an increase of 10%. Water bottles and combination syringes will get an increase of 15%.

Squash and handballs previously permitted no natural rubber may now use up to 65%.

Truck and bus tires will receive a substantial share of the natural rubber which will be made available to industry for the balance of the year, Mr. Sears later announced, on July 13. Explaining the effects of Amendment 2 to Appendix II of R-1, Mr. Sears said that special-service tires, as logger and off-the-road service tires, which are subjected continuously to severe wear, will also contain high percentages of natural rubber.

Pneumatic casings with cross-section 8.25 inches and larger of both highway and mud and snow tread design may be made with 94% natural rubber. The same percentage may be used in the production of large airplane tires for transport and bomber service and for the large special-purpose tires mentioned above. In many sizes this is an increase from 67% formerly allowed.

Smaller truck and bus tires and smaller-size special-purpose tires 7.50 inches and under will hereafter contain 67% of natural rubber. Formerly various tires in this group contained 13, 23, or 33% natural rubber.

During the war, because of the acute shortage of natural rubber and because synthetic rubber lacked resistance to heat build-up, it had been freely admitted that truck and bus tires were not capable of giving prewar performance. The previous increases of natural rubber for truck and bus tires, permitted last March, put an improved tire on the road for the hot weather driving. The additional amounts of natural rubber now authorized will add somewhat to tire performance in some of the types and sizes, Mr. Sears explained.

The two groups of tires mentioned above (8.25 inches and larger, and 7.50 inches and down) contained more than 50% natural rubber and hereafter will have no special identification in the way of a letter or number marking.

Passenger, motorcycle, small tractor, implement and industrial pneumatics may be now made with as much as 13% natural rubber as against the 2.5% previously permitted. However other pneumatic tires, such as bicycle, will continue to be made with 2½% natural rubber.

This additional natural rubber in passenger-car tires will alleviate many of the manufacturing and processing difficulties encountered with the present all-time high production rate, and the number of defective tires that have to be discarded in factories will be lessened, Mr. Sears said. There is no positive assurance, however, that passenger-car tires in the future will give any increased mileage over present performance, which has been the equivalent of pre-war mileages, he added.

Rumors to the contrary notwithstanding, there is no change in the restriction that all pneumatic tires shall be manufactured with black sidewalls only, Mr. Sears emphasized.

Camelback for the recapping of airplane and large truck tires, 14.00 inches and up, may now be made of all natural rubber.

The restriction, however, against a fifth new tire on new automobiles will be continued at least until October 1, Mr. Sears, announced July 23. This restriction is also contained in R-1.

"New car owners already have four new tires, and nothing prevents them from acquiring a recapped tire for use in emergencies," Mr. Sears explained. "Just consider how much better off they are than the owners of older cars, who in all probability have four tires which have gone many thousands of miles and perhaps one fairly new one."

The CPA Rubber Division has been endeavoring and will continue to try to see that passenger-car tires are distributed equitably, Mr. Sears added.

Tire manufacturers now are supplying four new tires for each new car built. This has been accomplished even though some new models have called for tire sizes different from those formerly in general use.

This original equipment demand has been met and will continue to be met by the tire industry. But a fifth new tire would mean that some driver with an old tire in dire need of replacement would have to go without one for a longer period of time, Mr. Sears said.

The CPA considers that for the present, the driving public will be better served with additional tires as replacements for worn-out tires on the road, rather than as fifth tires for new cars.

Recapping of usable tires is still an important way to get more mileage out of tires. A good recapping job will add at least 10,000 more miles to a serviceable tire casing.

The decision on spare tires will be reviewed early in the fourth quarter of this year, when it is expected that cooler weather, less car usage, and continued high production may have brought the supply of new passenger-car tires more nearly in line with demand.

The production rate for passenger-car tires for the past four months has averaged better than 5½ million tires each month, Mr. Sears pointed out. Of that production 83% has been shipped as replacement tires for cars now on the road. In other words, a passenger-car tire for replacement purposes for practically every car running has been put into the nation's distributing channels since the first of the year.

Schedules call for even greater production in the second six months, and if it is attained, this will mean two new tires for every car this year. This is three-fourths of a tire more per car, per year than before the war.

However the demand for passenger-car tires today and for the next two months, during the first peacetime vacation season in five years, is greater than ever before in history. Thus far the all-time record production has been unable to catch up with the wartime backlog and current replacement needs. Gasoline consumption, a means used in estimating tire wear, is reported to be at an all-time peak.

Although many so called "jalopies" are being junked each month, the age of vehicles on the road and their state of repair are showing no improvement. An old car, perhaps with wheels out of line, causes more tire wear than a new car or one in good mechanical condition.

Direction 17, Priorities Reg. 28, July 17, because of the acute shortage of plastic molding powder, plastic molding compounds, and synthetic resins, rules that CPA will not grant a CC rating for such products except in special cases of emergency.

Control on Rayon for Tires Tightened

To distribute tire-type high-tenacity rayon cord and yarn equitably throughout the tire industry, the Civilian Production Administration placed these products under more rigid control by the issuance of Amendment 1 to Appendix II, R-1, effective July 3. High-tenacity rayon cord and yarn are essential component materials in the manufacture of airplane, truck, and bus tires. (Use is not permitted in medium and smaller sized passenger tires.)

Cord and yarn production will be made available for those products enumerated in List 15 (permitted uses) of R-1.

Channeling will be accomplished in three ways: (1) by limiting the inventory of each tire company; (2) by certifying all orders placed by tire producers with the makers of cord and yarn; and (3) by removing two sizes of passenger tires from group A (order of preference and types) and transferring them to Group B (permitted use after needs of Group A have been filled).

Effective August 31, consumers' inventory of high-tenacity rayon cord and yarn is limited to 60 days' supply.

To insure further that the cord and yarn will be used in those products where they are needed, the order requires that

consumers place certified orders for the materials they plan to use. No tire-type high-tenacity rayon cord or yarn acquired by certification procedure may be consumed in the manufacture of any article not included in Group A of List 15.

Group B of List 15 lists two sizes of passenger-car tires which may be made with this cord or yarn, provided it is available, only after the requirements in Group A are filled.

Manufacturers of rayon cord and yarn may not honor non-certified orders until all certified orders are met.

Group A of List 15 giving the order of preference and type of product that may consume material bought by certification follows:

1. Airplane tires.
2. Self-sealing fuel cells.
3. Bullet-sealing hose.
4. Combat (U. S.) tires, including only cross-section 8.00 and larger
5. Mileage contract bus tires:
   (a) Inter-city;
   (b) City.
6. Synthetic special-purpose tires, including tread types: rock service, logger, earth-mover, and 18.00 and up mud and snow; all sizes.
7. Synthetic truck and bus tires, 10 plies and more.
8. Belts.
9. Tire repair materials.
10. Synthetic truck and bus tires six- and eight-ply.
11. Synthetic tires of the following types:
    Road Grader—all tread types and all sizes;
    Tractor implement and pneumatic industrial—all tread types and all sizes;
    Passenger—all tread types in sizes larger than 6.50 cross-section.

Items in Group B in which tire-type high-tenacity rayon tire cord and yarn may be used after certified orders have been filled are:

Passenger-car tires:
All tread types 6.50 cross-section including the 6.25/6.50 cured in the 6.50 mold.

Interim OPA Notes

Although the wartime price control expired June 30, many OPA regulations did not reach this desk until after that date; consequently the following items are listed to make our records complete.

Region VII Order G-6 under Supp. SR 47 to RMPR 165—Retail Shoe Repair Services in Montana—covers among other items Neolite half soles made by Goodyear Tire & Rubber Co.; Panolene soles of Panther-Panco Rubber Co.; and men's molded brown leather color plastic half soles manufactured by the O'Sullivan Rubber Co. Amendment 1 to Supp. SR. 32—Shoe Repair Services in Seattle, Wash.—includes in the order Neolite, Avonite, and Panolene full or half soles; O'Sullivan's men's brown and leather color plastic half soles; Neo-cord full soles; and brown composition, rubber, or fiber full or half soles.

Order 21, MPR 200, establishes maximum prices for sales by the manufacturer and by wholesalers in the shoe repair trade of men's black and brown super-grade rubber half heels, and round rubber revolving inserts therefor, bearing the brand name "Triple Wear," products of Michael M. Schatz, 3198 W. Seventh St., Los Angeles, Calif.

Order 125, RMPR 528, approves ceilings for four new sizes of U. S. Royal Logger tires made by United States Rubber Co.

OPA on July 15 warned that under an Executive Order signed by the President on June 30 "manufacturers, wholesalers and retailers, and all other persons required under price control regulations to have kept records must preserve them until July 1, 1947."

On July 25, however, President Truman signed the new price control law. Thereunder all rent and price ceilings and other orders of the OPA which were in effect June 30 were automatically restored except: ceilings on meat, poultry, eggs, dairy products, grain and feed, soybeans, cottonseed, petroleum and its products, tobacco and its products and the maximum average price order which required clothing manufacturers to make a certain proportion of cheap wear. But the OPA will be required to raise many of the ceilings within 60 days and to change some of its former practices.

World Rubber Markets

Market reports on rubber footwear, soles and heels, belts, belting, and hose are being received by the Office of International Trade, United States Department of Commerce, from the U. S. Foreign Service Missions. As the reports are received from the foreign field, they are consolidated, standardized, edited, and published by the Office of International Trade in its Industrial Reference Service, Part 8, General Products, on a classified country basis. For each of the countries in the series there are two Industrial Reference Services: one covering footwear, soles and heels; and the other covering belts, belting and hose.

These reports cover production and consumption of the products in the country discussed; imports from 1938 to the latest year for which figures are available; import duties and regulations; principal channels of distribution; and U. S. exports to the country, and prospects for future sales. If the outlook for sales of U. S. products is not encouraging, the reason is given; if the market is limited, the limitation is explained; and if there is a pent-up demand for the products, it is indicated. To date reports have been published for Brazil, Bolivia, Ecuador, Uruguay, Chile, Panama and Mexico.

The subscription rate for Part 8, General Products, is $1.50 per year, or 5¢ per copy. Part 8 includes products other than rubber, principally consumers durable goods. The first Industrial Reference Service for rubber products was published in May, 1946. Subscriptions may be obtained from the Superintendent of Documents, U.S. Government Printing Office, Washington 25, D. C.

"Rubber Statistical Bulletin"

The London Rubber Secretariat, set up by the governments of the United Kingdom, France, and the Netherlands, in connection with the Rubber Study Group formed by these three governments and by the United States has been commissioned to collect and publish comprehensive statistics relating to the rubber indutry. INDIA RUBBER WORLD *will be the exclusive distributer for this* "Rubber Statistical Bulletin" in the United States, the price of which will be 50¢ a copy or $5 for an annual subscription. The first issue was scheduled to appear in July, but has been delayed somewhat and is expected to appear in August.

The Bulletin will contain very full official statistics relating to production, export, import, consumption and stocks of natural, synthetic, and reclaimed rubbers annually during the war period and monthly from the beginning of 1946. It is also intended to include sections on statistics of rubber manufactured goods and of materials closely connected with the rubber industry. It may not however, prove possible to have these sections in the first issue. A section on rubber prices will also be included.

A feature of the first issue will be a supplement giving very complete statistics of natural rubber production, consumption, stocks, and prices from 1910 to 1940.

Send subscriptions to INDIA RUBBER WORLD, *386 Fourth Ave., New York* 16, N. Y.

War Assets Administration, Washington, D. C., last month listed in government surplus commodities available to all levels of trade throughout the country the following, showing also the quantity and the original cost to the government: rubber vulcanizing cement, 297,055 gallons, $164,566; cushion gum, 481,518 pounds, $251,833; combination gum, 20,322 pounds, $7,519; tread gum, 711,726 pounds, $362,980; tire patches, 1,298,263 units, $2,263,689; tire padding stock, 112,080 pounds, $75,093; tire cord fabric, 21,777 pounds, $11,760; tire air-pressure and chuck gages, air chucks, and tire pumps, 343,000 units, $350,000; sheet packing, including rubber and asbestos, large quantities, $234,449; single and dual-type tire chains, 78,339 units, $523,485; military goggles, 759,670 units, $2,145,677; protective suits, 289,430 units, $2,856,704; civilian gas masks, 570,364 units, $1,511,464; fire hose, 50,000 units, $1,250,000; impermeable aprons, 265,051 units, $1,309,031; impermeable rubber gloves, 794,385 units, $1,021,264; neoprene, 700,000 pounds, $310,000; 481 tons of cable; 286 tons of tire repair kits; used aircraft tires; rubber and friction tape, six million rolls, $970,000.

Taylor Wins Patent Suit

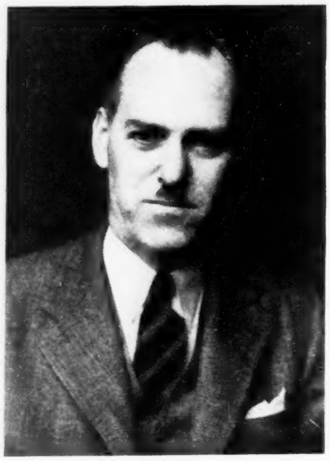
The Federal Court of Appeals, 2nd Circuit, has reversed a decision of the Federal District Court and dismissed the bill of complaint made by the Foxboro Co., Foxboro, Mass., against the Taylor Instrument Cos., Rochester, N. Y. The suit involved the Mason patent held by Foxboro which the court declared ineffective inasmuch as it covered nothing patentable over the prior work of earlier scientists. The original suit brought in the Federal District Court in 1944 involved three patents. The bill of complaint was dismissed on two of them in November of that year. Appeal was taken on the third by Taylor, and it is on this patent that the Court of Appeals has dismissed the complaint. The Fulscope air-operated instrument around which the suit centered is used in industrial processes to control automatically temperature, pressure, humidity, flow and liquid level, and is widely used in such industries as rubber, oil, chemical, dairy, textile, canning, and paper making. In Taylor's history of 95 years, this is only the second suit brought against the company for patent infringement, and in both cases Taylor has been vindicated.

EASTERN AND SOUTHERN

Tuley Promoted; Other U. S. Rubber Activities

William F. Tuley, assistant general sales manager, Naugatuck Chemical Division, has been appointed operations manager for the Synthetic Rubber Division, United States Rubber Co. With headquarters at the company's New York, N. Y., office, Rockefeller Center, Dr. Tuley will supervise production, production schedules, and production costs of the three synthetic rubber plants operated by the company at Naugatuck, Conn., Institute, W. Va., and Los Angeles, Calif. He will also maintain close contact with the company's synthetic rubber research and development program.

Dr. Tuley was born in Palmyra, Mo., where he received his early education. He was graduated from Oregon State College with a B.S. degree and received his Ph.D. degree in organic chemistry from the University of Illinois in 1926. He joined the general laboratories of U. S. Rubber at Passaic, N. J., in 1928 as a research chemist, but later was transferred to the laboratories of the Naugatuck Chemical Division at Naugatuck. After 11 years' on the research and development of industrial and rubber chemicals, Dr. Tuley was appointed assistant sales manager and later sales manager for rubber chemicals and reclaim. He continued his sales work until war came when his chemical and administrative experience was required in the production of explosives. In 1942 became assistant plant manager at the Pennsylvania Ordnance Works, Williamsport, Pa., which was operated by the rubber company, and later became plant manager. When the company received contracts from the War Department for the operation of the Kankakee Ordnance Works, Joliet, Ill., Dr. Tuley was made plant manager, a position he held until June, 1945, when he became assistant general sales manager for the Naugatuck Chemical Division.



William F. Tuley

The company has opened a new district office for U.S. Tires at Des Moines, Iowa, and appointed J. C. O'Gorman district manager. B. H. Bowen succeeds Mr. O'Gorman as manager of the U.S. Tires commercial merchandising department.

Mr. O'Gorman served with other rubber companies for several years before becoming affiliated with U. S. Rubber in 1938 at Omaha. In 1942 he was transferred to the businesss development department at the company's general office in New York. Last year he became manager of government tire activities for the U.S. Tires division and later was appointed manager of commercial merchandising.

Mr. Bowen, after considerable experience with other companies, joined U. S. Rubber in 1936 as a department manager at the general office. During 1940 he was commercial tire manager at the plant in Chicopee Falls, Mass., but later served as district manager for U.S. Tires at Los Angeles and Buffalo. Returning to the general office in 1941, he became assistant merchandising manager for the U.S. truck tire division and in 1942, Gillette tire district manager in the New York branch.

Ralph C. Zehner and John J. Montean have been named technical sales representatives to cover the Mid-Atlantic states for the Naugatuck Aromatics Division. They will make their headquarters at the division's New York office, 254 Fourth Ave. Before joining the rubber company in 1942, Mr. Zehner had seven years' experience in the production, sales, and development of cosmetics, aromatics, pharmaceuticals, and essential oils. Since coming to U. S. Rubber he has been engaged in the production of explosives at the company operated Pennsylvania Ordnance Works, Williampsort, Pa., and Kankakee Ordance Works, Joliet, Ill. Mr. Montean became associated with the Naugatuck Chemical Division in November, 1943, specializing in synthetic rubber research and development at the Naugatuck, Conn., synthetic rubber plant. Then in June, 1944, he entered the commercial development department at the Naugatuck plant, where he remained until his recent appointment.

Two Gillette tire appointments were announced recently by H. C. McDermott, sales manager of the Gillette tire division. J. J. Stephens becomes manager of the eastern district, and F. A. Foster succeeds Mr. Stephens as merchandise manager of tires and tubes. Before his appointment as merchandise manager last year, Mr. Stephens served as Gillette sales representative in Pittsburgh. In his new position he replaces B. H. Bowen. Mr. Foster joined the company in 1936 as chief clerk in the sundries sales department at St. Louis and in 1939 became a salesman. In 1944 he was transferred to the Gillette division as a sales representative in the Memphis district. He was named merchandise manager of allied products in 1945.

Coordination of industrial relations activities for the Naugatuck Chemical and Synthetic Rubber Divisions under William E. Bradford as service manager was announced last month. Mr. Bradford will make his headquarters at the synthetic rubber plant operated by the company at Naugauck, Conn., where he will supervise industrial relations for the Naugatuck synthetic rubber plant, the Naugatuck plant of the Chemical Division, and the two company operated synthetic rubber plants at Institute, W. Va., and Los Angeles, Calif. Mr. Bradford in 1914 joined the staff of the rubber company's Detroit tire plant. There he served as production supervisor and assistant manager of industrial relations. He was transferred to the synthetic rubber plant operated by the company at Institute as assistant service manager in 1944. Five months later he became service manager, in which capacity he served until his present appointment.

U. S. Rubber has signed a three-year lease, with option to buy, on two factory buildings in Washington, Ind., with 90,000 square feet of manufacturing area to be used for the production of waterproof clothing. The rubber company expects to start production in one plant on July 29, with 160 men and women. Production will be increased to a two-shift operation with 300 people as quickly as materials are available. Operations in the second plant are expected to start about October 1, after a new boiler and vulcanizer building have been erected. This plant in full operation will employ about 450 people.

A new chart showing changes in branch circuit wiring requirements in the 1946 National Electrical Code is being distributed by the wire and cable department of U. S. Rubber. The chart indicates clearly the differences between the 1940 and 1946 codes. It is printed in two colors and furnished with a wall hanger. Copies may be obtained from the company's general offices, 1230 Avenue of the Americas, New York 20, N. Y.

To help lessen accidents around the home the company announced a new type underlay that will, it is claimed, anchor scatter rugs and runners securely to highly polished floors. The protective underlay is a sponge rubber cushion reinforced internally with a strong fabric. It is being made in 24-, 32-, and 54-inch widths that can be cut to fit any size of rug or runner. Color is an attractive green. The new material will not only guard against slippage, but will also save wear on rugs. Other claims of advantages are that it can be cleaned with a damp cloth, and it will not mark or stick to the floor. It is also said to be durable, mothproof, odorless, and sanitary. Known as U. S. Non-Slip, the underlay is being sold through rug dealers, floor covering shops, and carpet and rug departments of department stores.

American Viscose Corp., 350 Fifth Ave., New York, N. Y., has negotiated a new accident and sickness insurance plan for its employes with the Textile Workers Union of America, effective June 1. Under this plan the company will provide accident and sickness benefits at its own expense. These benefits will vary in accordance with wages or salaries from \$12.50 to \$22 per week and will be paid for a maximum period of 13 weeks for any one period of disability. The plan also provides for payment of surgical fees, in accordance with a schedule, up to a maximum of \$150. Norman Randolph, of the company's industrial relations department, has been assigned to initiate the procedures in connection with the new plan at the company's seven plants. In providing pensions, group life insurance, accident and sickness benefits, and surgical benefits for its employes, the company is spending annually approximately 5% of its payroll, or \$2,295,000 a year.

American Cyanamid Reorganization

American Cyanamid Co., 30 Rockefeller Plaza, New York, N. Y., on July 22 announced that, effective July 31, the business of American Cyanamid & Chemical Corp., a subsidiary, will be consolidated with that of the parent company, American Cyanamid Co. This action is in line with the general plan for the simplification of the corporate structure of the Cyanamid organization, and henceforth the business of American Cyanamid & Chemical Corp. will be operated as the industrial chemicals division of American Cyanamid Co.

The history of American Cyanamid & Chemical Corp. dates back to 1929 when American Cyanamid Co. acquired the business of the Kalbfleisch Corp., one of the oldest in the American chemical field and outstanding for its production of chemicals for the pulp and paper industry. The name was later changed to American Cyanamid & Chemical Corp. To this new subsidiary the company transferred technical service and the production and sale of many industrial chemicals. The company today gives technical service and sells to practically every chemical-consuming industry.

As the industrial chemicals division of American Cyanamid Co., it will handle the sale of insecticides, gypsum products, prussiates, sodium phosphates, case hardeners, rubber accelerators, a full line of industrial explosives including dynamite, blasting powders, and electric blasting caps, nitrocellulose for coatings and finishes, phthalic anhydride as a base or vat dyes and as an important constituent of synthetic resins, which are revitalizing the paint, lacquer, varnish and enamel industries. It is also a large distributer of chemical specialties serving particularly the rubber, textile, and leather industries.

A similar consolidation is planned with regard to Lederle Laboratories Inc., Pearl River, N. Y., the Cyanamid unit which produces pharmaceutical and biological products for human and veterinary use. This consolidation is expected to become effective in the near future.

Manhattan Rubber Division, Raybestos-Manhattan, Inc., Passaic, N. J., again received two first awards from the National Advertising Agency Network at its thirteenth annual competition held recently in Colorado Springs, Colo. The first of these honors was for the best integrated advertising and merchandising campaign, which was also received by Manhattan last year as the initial award under this classification. The other award was for the best business paper advertising campaign, which Manhattan also received for three consecutive years: 1941, 1942, and 1943. These awards bring to a total of seven the number of first awards received by Manhattan during the past year.

The Division has also announced that its Manhattan bowling ball, developed just prior to the war and suspended as a war conservation measure, is now available. These A.B.C. regulation bowling balls are made as near a perfect sphere as is humanly and mechanically possible, and total variation is claimed to be within the thickness of a human hair. This precision is made possible by the use of manufacturing and inspectional equipment designed by the company. The Manhattan bowling ball is said to be the only ball drilled on the spot for accurate fit. The company's dealers in all parts of the country are supplied with drilling jigs, making it possible to fit a ball accurately to the bowler's individual grip. Dealers can also install Manhattan's patented "Easy-Hold" to protect the thumb from blisters, relieve fatigue, and to prevent slipping.

Cyril S. Kimball, vice president of Foster D. Snell, Inc., 305 Washington St., Brooklyn 1, N. Y., on July 12 was elected by the council of the Society of the Chemical industry in London the American vice president of the S.C.I.

Hewitt-Robins, Inc., Buffalo, N. Y., has announced that Howard D. Herbert has joined the Restfoam sales department of Hewitt Rubber at the Buffalo headquarters. Mr. Herbert served the Goodyear Tire & Rubber Co. for 15 years and was manager of Airfoam sales since 1940. During the war he was active in both design and sales of foam rubber vibration dampening and shock equipment used on war materiel.

Financial World, 86 Trinity Place, New York 6, N. Y., in its annual report survey includes among the corporations achieving "Merit Award" citations: Armstrong Rubber Co., Dayton Rubber Mfg. Co., General Tire & Rubber Co., Goodyear Tire & Rubber Co., Hewitt-Robins, Inc., Norwalk Tire & Rubber Co., Seiberling Rubber Co., and The Thermoid Co. One of these companies will be awarded the bronze "Oscar of Industry" for the best 1945 annual report of the rubber industry in the final judging that culminates in the annual report awards banquet at the Waldorf-Astoria Hotel on October 4. Last fall Dayton Rubber won the "Best-of-Industry" award, followed by Seiberling.

OHIO

Rubber Factory for Peru

Announcement that substantial Peruvian interests, associated with International B. F. Goodrich Co., Akron, had been granted a license by the Peruvian Government to build a manufacturing plant near Lima for tires, tubes, and miscellaneous rubber goods, was made in Peru last month.

Several appointments in the International B. F. Goodrich Co., were announced last month by Stanley W. Caywood, president.

Norman H. Keeling, manager of the company's Washington office for the last several years and previous to that manager of the B. F. Goodrich Store in Akron for five years, was made sales manager for the Hawaiian Islands, with headquarters in Honolulu. He has had wide experience in sales executive posts with the company, including also the managership of the Buffalo district, sales promotion manager in several districts and in the advertising department. Mr. Keeling succeeds N. F. Weber, transferred to San Francisco in charge of the office there, where he replaces John T. Staker, who has gone into business for himself. Mr. Keeling is succeeded at Washington by Elliott R. McKee, who represented the company in the Far East for 10 years.

Wilbur J. Bunnell, widely known in rubber circles in the Far East, has been named operations manager for the company in the Philippine Islands, with headquarters in Manila. Mr. Bunnell and his wife, both natives of Akron, were in the Philippines when war came and were interned for several years in the Santo Tomas prison camp.

B. F. Goodrich Co. Notes

C. A. Dwyer has been placed in charge of the sales of industrial and solid tires of the Goodrich company. With the rubber industry since 1919, Mr. Dwyer had recently been serving the company as coordinator of federal regulations and on special assignments. He served on the staff of the Office of Rubber Director during the early part of the war.

A "spray-on" treatment for giving aircraft deicers a protective summer coating, easily peeled off when icing weather returns, has been developed by Goodrich chemists and is undergoing further tests. The material, sprayed on like paint, is of aluminum color and keeps out the ultraviolet rays of the sun, the chief factor in the aging resulting from direct exposure to sunlight. The color also keeps the deicer cooler by reflecting the sun's heat, rather than absorbing it. First trials indicate that about $1\frac{1}{2}$ gallons of the material would be used for a plane of the DC-3 size, and the added weight would amount to about only five pounds. Time required to spray and dry a job of this size will be considerably less than three hours, the test showed.

A definite postwar trend to dual-wheeled landing gear on airplanes, particularly the larger craft, is welcomed by Akron tire engineers as an important forward step toward greater safety in air transportation. According to Henry F. Schippel, aeronautical engineering manager of Goodrich's tire division, adoption of multiple-tire landing gear by designers of new large planes was doubtless spurred by the great safety record established by such military planes as the Boeing B-29 and others. There was not one crack-up due to tire failure on any of the ships using dual tires during the war, said Mr. Schippel, who also pointed out that the recommending of duals was by no means a matter of selling more tires, for duals actually cost less per pair than the giant single tire needed to do an equivalent job. Practically all of the new large transport planes now being designed will use dual- or multiple-wheel assemblies, and the trend is also discernible in ships of moderate size.

A transport airplane, owned by Goodrich and based in Akron, has flown more than 112,000 miles in a year's operations over 24 states, Canada, Mexico, and Cuba, the company reports. The plane, a Lockheed Lodestar used by the company to link its branch plants and district offices with the Akron headquarters, transported 822 passengers during the year and was flown more than 500 hours. The pilots are Tom Kennedy and Hume Earnest, both of Akron. A second twin-engine

transport in similar service is also operated by the company. Goodrich purchased its first airplane for use in company business in 1928.

"Retirement" of fire apparatus tires after three or four years in service, transferring them to slow-moving city trucks or even selling them, was urged by J. E. Powers, truck and bus tire sales manager for Goodrich, at the twenty-fourth annual conference of the New England Association of Fire Chiefs on June 26 at Portsmouth, N. H. Tires in fire service, often kept in use for many years with little mileage as compared with other tires, present a unique service problem, Mr. Powers declared. Despite the fine wearing qualities of modern tires, they may sustain injuries in fire service which, because of the limited usage of the tires, will not develop into noticeable tire damage for many months, he pointed out. Fire departments in some cities replace their tires periodically after three to five years in service, the Goodrich executive said, and advocated that this policy be considered by other cities now that the wartime tire shortage is about over, in view of the safety factors involved.

Industrial Rayon Expanding

Industrial Rayon Corp., Cleveland, disclosed its plans for the expansion of its machinery manufacturing operations and research activity when it announced last month that it had arranged to lease 43,000 square feet of floor space at 880 E. 72nd St., Cleveland. Lorin A. Corey is manager of Industrial Rayon's machinery division, which will occupy this space under a five-year lease. This plant will be devoted to the manufacture of spindles, thread-advancing reels, and other parts for continuous process spinning machines which the company is building for export, in addition to machinery for the company's own plants. The company has contracts to manufacture the initial continuous spinning machines for new plants employing Industrial Rayon's process in England and Sweden and is to furnish all the continuous process machines for the new plant of Compania Rayonera Cubana, which has purchased Cuban rights to the Industrial Rayon process. Besides the manufacturing operations, mechanical research and development work will be carried out at the new location. The space previously devoted to these activities at the West Side plant will be used to accommodate the company's expanding research activities.

Appointment of G. F. D'Alelio as manager of high-polymer research for Industrial Rayon was announced by Hayden B. Kline, company vice president. As a research worker, staff chemist, and director of the plastics laboratories of the General Electric Co. from 1936 to 1943, and more recently as vice president and director of research of the Pro-phy-lac-tic Brush Co., Dr. D'Alelio has been a leading figure in plastics development and has been granted more than 230 United States patents. Dr. D'Alelio's industrial activities have included the discovery and development of the secret insulation used as a radar connector, direction of the research on the laminated bazooka used as rocket launchers, and on low-pressure laminated work for large radar installations, aircraft fuselages, etc. He also directed the research for GE's large synthetic phenol plant, introduced the continuous mono-chlorination benzine process, and was in charge of research and other work leading to construction of a pilot plant for GE's ampholite, a urea-type molding compound.

A native of Boston, Dr. D'Alelio attended Boston College and was awarded the Charles J. O'Malley fellowship in 1931 for study at Johns Hopkins University, leading to a Ph.D. degree in chemistry in 1935. After teaching briefly at the Boston College Graduate School, he joined General Electric in 1936, leaving the company in February, 1943, to accept the research directorship at Pro-phy-lac-tic, which named him vice president in June, 1944. Dr. D'Alelio was a member of several honorary fraternities and of various technical societies, including the American Chemical Society and the American Institute of Chemists. He recently received an individual citation from the Navy Bureau of Ordnance in recognition of his war research and development work. During the war he served as an industrial consultant to the referee board of the Office of Production Research and Development, on the advisory panel to the Committee on Quartermasters Problems of the National Research Council, as a consultant to the Navy Bureau of Ordnance, and on the Manhattan Project atomic bomb group at Columbia University.

Karch with Hall Company

The C. P. Hall Co. Akron rubber chemical supply firm, has appointed Herbert S. Karch technical sales representative for the territory formerly covered by Arthur E. Warner, late vice president of the Hall organization. Mr. Karch steps into his new position from overseas duty as a major in the U. S. Army. He recently received the Army Commendation Ribbon awarded for work done for the Office of the Foreign Liquidation Commissioner in Paris, with members of the Czechoslovakian Mission. During the early months of the war Mr. Karch served with the Cleveland Ordnance District as procurement, administrative, and production engineering officer on materiel produced in the Cleveland area.

Next he instituted the Rubber Conservation Program for the European Division of Air Transport Command, visiting A.T.C. bases and airfields in Great Britain and on the continent. Later, as a supply officer in the Ordnance Department for the Northwestern European tire manufacturing program, he coordinated the introduction of American synthetic rubber to all important auto and bicycle tire and bicycle factories in France, Belgium, and Holland.

Herbert S. Karch

In prewar years Mr. Karch attended the University of Cincinnati, earned the degrees of B.S. in metallurgical engineering, and M.S. at Carnegie Institute of Technology and also studied at Akron University and Akron Law School. He was employed as service and development chemist at The B. F. Goodrich Co., chief chemist at the India Tire Co., and technical superintendent at Gro-Cord Rubber Co. and Martin Tire Corp.

He is also a member of Lambda Chi Alpha, American Chemical Society, American Society for Testing Materials, American Legion, 37th Division Veterans' Association, and Reserve Officers' Association.

He lives with his family of four at Silver Lake, Cuyahoga Falls, O.

Firestone Announcements

Firestone Tire & Rubber Co., Akron, through Lee R. Jackson, executive vice president, announced a new Firestone DeLuxe Champion tire. Manufactured with a special new type of rayon cord developed by Firestone, the whole new tire is especially engineered for this new rayon body construction. Even with these improvements, the new DeLuxe Champion tire, in all sizes, will be sold at regular tire prices. According to Mr. Jackson, the new tire is built on principles that insure greater non-skid qualities, longest mileage, and highest degree of safety with a maximum in stability and riding comfort. The new tire was submitted to gruelling tests which proved it to be 55% stronger, to give 60% more effective non-skid protection, and to give up to 32% longer mileage. Car manufacturers' rugged testing grounds, tire punishing devices in Firestone laboratories, and tests conducted on the Indianapolis Speedway have combined to prove the outstanding qualities of the new tire. It contains eight circumferential ribs and has a wider and flatter tread which gives greater mileage, increased stability, and greater riding comfort. The special Firestone rayon cord is being used in all tires of 6.50 size and larger. Tires smaller than 6.50 will be built with Firestone's extra-strong cotton cord bodies until rayon is available for all sizes. Other features of the new tire include patented gum-dipped cord calendered with Vitamic rubber, and Safti-Sured construction which welds all body plies and the tread into a strong, inseparable unit.

A new cooling tower is being erected at the Firestone plant at 2525 Firestone Ave., Los Angeles, Calif., at a cost of $35,000.

With an expected demand in excess of 10,000,000 mattress units of all types during the first full postwar year of production, Eliot W. Howard, trade sales manager of the Firestone Industrial Products Co., predicted that the rubber industry will furnish one million foamed rubber mattress units provided raw material is available. Firestone Foamex mattresses will not be available to the general public

until early 1947. Delay in sizable production has been due to various factors arising from a combination of government control of rubber and shortages in other vital materials. Firestone will provide the complete mattress unit, including the padding and ticking. The finished product will be distributed directly to the retail trade, and sales volume is expected to reach $10,000,000 during the first year of output. Future uses of Foamex include carpet base, construction of dress forms, shoulder pads, surgical pads of all kinds, utility cushioning in hospitals, utility sponges, and all types of padding.

General Tire & Rubber Co., Akron, held its first postwar convention on the Pacific Coast at the Biltmore Hotel, Los Angeles, Calif., when more than 150 General tire dealers from Southern California, Arizona, and New Mexico during the week ending July 20 met executives of the company, including L. A. McQueen, vice president; Jack Powers and Karl Dalsky, assistants to Mr. McQueen; and Ralph Harrington, advertising manager. Present also were E. C. Leach and S. Seward of the D'Arcy Advertising Agency. In charge of the conference was Roy Doss, Los Angeles regional manager of General Tire.

The Dayton Rubber Mfg. Co., Dayton 1, recently had as a visitor A. Manuel Vega, distributer in Lima, Peru, for the Dayton Rubber Export Co., who stated that the demand for United States commodities has reached an all-time high in South America.

The tool and die division of Lester Engineering Co. was reorganized as The Lester-Aetna Die Co. and moved from Cleveland to Warren, O. Facilities at the new location have been considerably expanded, both in skilled personnel and the latest in tool room equipment, offering the trade complete engineering and manufacturing service for both die casting dies and plastic molds. Lester-Aetna Die is jointly owned by Lester Engineering and Aetna-Standard Engineering Co., Warren. Officers of the new company are: Nathan Lester, president; H. Gerald Coffey and D. White, vice presidents; Lloyd L. Dalbey, secretary-treasurer No change has been made in the organization and basic operations of Lester Engineering as producer of Lester injection molding machines and Lester die casting machines.

Seiberling Rubber Co., Akron, according to President J. Penfield Seiberling, despite a slight decrease in sales for the first quarter this year showed a net profit nearly double that for the corresponding period last year. The slight decline in sales was attributed to production slowdowns due primarily to shortages of materials. The sale of tires and tubes for replacement purposes, however, during the first three months of 1946 were 51% greater than in the like period last year. Mr. Seiberling further stated that the outlook for the balance of 1946 is most encouraging, with production steadily rising and demand for tires and tubes from the public still continuing.

B. F. Goodrich Chemical Co., Rose Bldg., Cleveland, played host to visiting British industrialists who are in this country to study methods of manufacturing Geon polyvinyl chloride resin and plastics, products of the chemical company. They have visited the Avon, O., Niagara Falls, N. Y., Akron, O., and Louisville, Ky., Geon plants and have exchanged valuable research information and plans of further research with Goodrich Chemical executives including President W. S. Richardson, F. K. Shoenfeld, vice president-technical; and R. P. Kenney, international sales manager. The British industrialists were S. J. Skinner, technical sales manager, British Geon, Ltd., J. J. P. Staudinger, manager of plastics research, and F. Roffey controller of research and development, both of Distillers Co., Ltd., London. British Geon was recently formed for the manufacture of Geon in the British Isles, and Distillers, Ltd., is the partner of Goodrich Chemical in this manufacture.

The Sun Rubber Co., manufacturer of hose and molded rubber products, Bucyrus, according to President M. G. Nussbaum, has begun construction on a four-story addition, adding 66,000 square feet of factory and office space for further expansion and current production, which is in molded and braided garden, automobile heater, and mechanical hose. About 200 employes will be added upon completion early in 1947.

Goodyear Appointments

Goodyear Tire & Rubber Co., Akron, last month made several changes among its personnel.

Expansion of activities in the field of fundamental research on high polymers has brought two additions to Goodyear's research laboratory, according to L. B. Sebrell, company research director. Pioneering work on new types of synthetic plastic materials is being done by Harold R. Mighton, who was affiliated with Canadian Medical Research on the antimalaria project during the war, after receiving his doctorate from Columbia University in 1944. Dr. Mighton holds A.B. and M.A. degrees from the University of Saskatchewan.

Thomas G. Fox, Jr., war veteran who also received his doctorate from Columbia in 1943, has been assigned to a special Navy project involving fundamental research on high polymers. Dr. Fox received his B.S. degree from Lebanon Valley College. Both chemists will work under the direction of Paul J. Flory, one of the country's leading experts on high polymers. Dr. Flory has specialized in high-polymer constitution, viscosities of polymeric substances, and photochemistry.

Return of Harold D. Cunningham to Goodyear's Akron organization was revealed with his appointment as division superintendent of the company's Plants 1, 2, and 3 warehousing and shipping operations. Since 1944 he had been manager of merchandise and material control at Goodyear Fabric Corp., New Bedford, Mass. Previously he had held a similar position at the company's tire factory in Jackson, Mich., and had been manager of Goodyear warehouses in Detroit and Chicago. Mr. Cunningham came to the rubber company in Akron in 1928, working first in production and later holding several supervisory positions in the shipping division.

Assignment of two specialists in the Pliofilm sales department was announced last month. J. C. E. Williams, former Goodyear man recently returned from military service, has been named manager of converter sales, and E. J. Dunlavy, Jr., ex-Navy flier, has been assigned to the fabricating field. Both men will report to A. F. Landefeld, Pliofilm sales manager. Mr. Williams will coordinate the activity of the converters in the packaging field; while A. B. Clunan, present manager of direct packaging sales, will supervise the activities of the field organization on direct sales to the packaging trade.

Robert F. Pfister has been named chief compounder at the Goodyear-Oxo factory in Lecheria, Mexico. A native of Indianapolis, Ind., Mr. Pfister received a B.S. in chemistry at the University of Dayton. He joined Goodyear in 1939 at the Los Angeles, Calif., plant, going through the squadron before transferring to development work. He came to the Akron development division in 1944.

Appointment of John J. Hickey as technical manager of mechanical goods operations at Goodyear's plant in Wolverhampton, England, was announced last month. A native of Hamilton, Ont., Canada, Mr. Hickey joined Goodyear in Akron in 1935 and has held several responsible posts in the company's development division. He is a graduate of the University of Toronto.

A native of China, Ming Tai Lee, has been appointed mechanical goods representative for Goodyear in China, with headquarters in Shanghai. Mr. Lee left China in 1938 to attend the University of Hawaii. During the war he transferred to the University of California, graduating in 1944. That year he joined Goodyear in Akron, preparing for his overseas post by working in the development division and the Goodyear Export Co. He furthered his Goodyear training by taking several courses in the company's industrial university.

Walter A. Hazlett, managing director of Goodyear-Great Britain since 1937, has rounded out four decades of service. He received his 40-year service pin recently from Lord Hugh M. Trenchard, a director of the company, at a ceremony at the factory in Wolverhampton, England. A native of Harrison County, O., Mr. Hazlett attended high school and Mt. Union College before joining Goodyear in Akron as a clerk in 1906. Soon afterward he transferred to the company's sales division and held several responsible posts before going to England. In 1923, after being sales branch manager in Pittsburgh and Detroit, Mr. Hazlett was made manager of the central sales division. In 1934 he went to Los Angeles as western division manager and as vice president of the Goodyear-California organization.

Transfer of Goodyear's aviation products division offices from 600 W. 58th St., New York, N. Y., to Roosevelt Field, Long Island, was announced by R. W. Richardson, manager aviation products division. Moving of the office brings Donald W. Critchfield, New York district manager, closer to his contacts with eastern airplane manufacturers, airlines, and aviation products distributors. Mr. Critchfield, who flys Goodyear's Fairchild

24 on his business rounds, has kept the plane at Roosevelt Field since 1941. The move saves countless hours in travel time. A graduate of the University of Kansas, Mr. Critchfield this month completed 20 years with Goodyear. He has held a commercial flying license since 1931.

Mr. Richardson later announced establishment of an aviation products division and export office at Ninth St. and Biscayne Blvd., Miami, Fla., with Wayne A. Carlson as district manager. Carlson has been a Goodyear employe since 1935. While he started in the factory, successive promotions brought him managership of the time study division at Goodyear Aircraft, Litchfield Park, Ariz., where he remained from 1941 through 1943. The past 30 months he has been field service representative for Goodyear-built Corsairs.

Kenneth L. Calhoun, special representative of Goodyear's commercial sales department, last month completed three decades with the company. Presentation of a 30-year service pin was made by J. E. Mayl, vice president. Mr. Calhoun began his Goodyear career as a general line salesman in the Chicago district in 1916 and later served as staffman in charge of bus tires; he became manager of the bus and taxi division in 1932. The veteran was placed in charge of the sales division's mileage accounts in 1936. His present position embodies the supervision of city transit accounts coast to coast, with headquarters in Akron.

Several personnel changes at Goodyear Aircraft Corp., Akron, have been announced by Russell DeYoung, vice president and general manager.

J. B. Jones, manager of research and development since 1942, has been placed in charge of the recently organized aerophysics department, succeeding Elgin L. Shaw, who is leaving Goodyear after nearly 17 years' service. Mr. Jones, a graduate of Rensselaer Polytechnical Institute and New York University, joined the company in 1940 as a development engineer. He is succeeded in his former post by C. J. Pennig, engineering design manager. A University of Minnesota graduate, Mr. Pennig was a tire designer for Goodyear Tire before transferring to Aircraft in 1940. During the war he was manager of heavier-than-air engineering for three aircraft plants.

The company's photographic and blueprint division has been placed under S. T. Day, manager of administrative engineering.

Improved Products Developed

A new inflatable boat, embodying construction features developed in the manufacture of wartime life rafts, has been introduced by Goodyear. Constructed of synthetic rubber coated nylon fabric, the boat is stated to be 40% lighter and many times stronger than any previous boat of comparable size. Rigidity afforded by an inflatable rubber floor assures efficient operation with a 1.5 h.p. outboard motor; while a speed of five miles per hour has been attained in tests with a three h.p. motor. The lightweight standard unit includes boat, sectional floating oars, hand pump, repair kit, and carrying case. With addition of the inflatable floor and motor mount to the unit, the total weight is still under 45 pounds. The twin-tube design has been introduced into the boat. Two entirely separate air chambers form the hull, with the upper chamber offset to provide greater internal space. The design insures maximum freeboard and protection against spray in rough water and guarantees a greater degree of buoyancy and safety. The boat has air-inflated seats that will comfortably seat three persons, with ample room for four. Use of the rubber-coated nylon fabric has made the boat gasoline, oil, and mildew resistant.

Giant Goodyear 110-inch tires, claimed the largest ever manufactured, are being used on the Army Air Forces' newest super-bomber, the XB-36, it was disclosed by company officials. The tires are 44 inches across the beads and 36 inches from one sidewall to the other. More than 735 pounds of rubber, 420 pounds of fabric, and approximately seven miles of bead wire are used in each of the 34-ply tires. Each unit, comprising tire, tube, and Goodyear wheels and brakes, weighs 4,000 pounds.

Airfoam upholstered furniture will soon be on the market following its disappearance during the war years, according to Goodyear. A whipped latex material, Airfoam is offered for use in davenports and chairs for homes, offices, hotels, and other institutions, as well as for airplane, bus, truck, and automobile cushions. According to C. P. Joslyn, manager of Goodyear's chemical products division, present production schedules make it possible for the company to give prompt delivery of limited quantities. First showing of postwar furniture making use of this rubber cushioning material was scheduled for the Chicago Furniture Mart in July. Airfoam is unlike chemically blown or sponge rubber materials, said Mr. Joslyn. Mechanically whipped before curing, the latex becomes a finely divided, interconnected cell structure which is then placed into a mold cavity, completely filled before curing. During vulcanization, the vented mold and the interconnected cell structure allow the heating medium to penetrate to the center of the structure, resulting in a uniform cure regardless of shape or thickness of the piece.

A dynamometer test truck designed to test the range of large tires and wheel equipment used in the off-the-road field has been completed by Goodyear. The truck, first of its type in the industry, will be made available to the various manufacturers of off-the-road machinery for testing tires and their equipment. Information from these tests will be for the exclusive use of the manufacturer for whom the tests are made. The new test vehicle has been designed to measure pulls imposed upon it due either to tractive effort or rolling resistance. It may be used to determine the effect of tire size, load inflation, deflection, and speed on traction and rolling resistance. Other uses including showing the average drawbar pull from tractors and similar equipment the additional drawbar pull of tractors over that required to pull a wagon or scraper, and the horsepower delivered by powered vehicles in different gears. It will show the travel reduction due to tire slippage on ground, effective tire rolling radius as compared with static deflected radius, effect of ground penetration on drawbar pull consumption and on rolling resistance, and the tractive effort with different degrees of wheel tracking.

The truck, made from a six-ton Army vehicle with six-wheel drive, was modified to adapt it for this purpose. It is of sufficient size and weight and so equipped as to permit its use with all sizes of off-the-road equipment, including the largest now made or projected. The truck has a set of instruments to show accurately the speeds over the range in which this work normally will be performed, as well as to measure the distance traveled. Specially designed equipment makes it possible to obtain a quick and accurate average of the pulls measured in a test, thus compensating for unevenness of the surfaces over which the test is made. A master switch controls all the test equipment, providing an accurate record of all the measured conditions during the test run. Principles of design are similar to those of a smaller dynamometer truck used by Goodyear in the testing of agricultural types of tires and tractors.

Recently made available in limited quantities to the tobacco industry for wrapping the finished product, Pliofilm, Goodyear's packaging material, has been found ideal for preservation of leaf and filler by several tobacco warehouses. J. H. Conrad, tobacco packaging specialist of Goodyear's chemical products division, states that Pliofilm has proved itself as an individual humidor for cigars, cigarettes, smoking and chewing tobacco. Because of its high moisture transmission rate, tobacco is kept in humidified warehouses, Mr. Conrad explained, and Pliofilm alone, or laminated to other materials, is replacing conventional rubber blankets for retention of this original moisture. Hands of leaf and filler tobacco shipped to tobacco processors in Pliofilm insure their arrival in first-quality condition. The tobacco is packaged in prepared Pliofilm bags or wrappers and heat sealed, making an airtight, moistureproof container. Mr. Conrad also stated that in the cigar industry, tobacco is being issued to machines in small quantities packaged with Pliofilm as a moisture control factor. In addition Pliofilm is also being adopted as an overwrap

Goodyear Dynamometer Test Truck for Off-The-Road Tires

for cigar boxes which usually see considerable time elapse from the date they leave the manufacturer until they are placed on sale on the retail counter.

At first glance there seems to be little connection between the rubber industry and the housewife's flaky pies, but FF Pliofilm, a Goodyear natural rubber by-product, has been found excellent in the marketing and preservation of frozen pie dough. Said to be impervious to grease and oils, as well as moisture-proof and transparent, FF Pliofilm is thermoplastic, making it possible for the commercial packer to seal completely within the package all of the product's original freshness and flavor. Tests made in Goodyear's research laboratories show the film to be free from brittleness at temperatures as low as -20° F. The Home Kitchen Co., Pittsburgh, Pa., has found through exhaustive testing that FF Pliofilm permits a weight loss of only 0.1% at 40° during a 24-day period, and an 0.2% loss at the same temperature over a 40-day period. According to Miss Rita Marie Dury, supervisor of that company's testing kitchen, this negligible loss in weight was in contrast to losses ranging from 0.2-1.2% during the 24-day period for other packaging materials. Weight losses over the 40-day testing period for the other materials ranged from 1.0-2.3%.

NEW ENGLAND

General Electric Co., chemical department, Pittsfield, Mass., has appointed John C. Morris superintendent of manufacturing of the resin and insulation materials division. Assistant superintendent for the past year, Mr. Morris started with General Electric in the payroll section in 1928 and served successively in the induction motor cost section (1929), the mica cost section (1931), as cost section head and supervising clerk (1935), as assistant to the superintendent of the mica section (1940), and assistant superintendent (1943).

Heads Farrel's Akron Office

After 3½ years in the U. S. Navy in which he served as executive officer, Ordnance Gage Division at Naval Gun Factory, Washington, D. C., Lt. Comdr. William R. Bowen, U. S. N. R., has returned to Farrel-Birmingham Co., Inc., Ansonia, Conn., and is now manager of the company's branch sales office at Akron O. He succeeds Harry D. Temporal who will manage the Farrel-Birmingham office in Chicago.

Mr. Bowen, a graduate of Pratt Institute and a licensed engineer in the State of Connecticut, was first employed by Farrel-Birmingham in April, 1934. He served in various engineering capacities until March, 1942, when he was appointed assistant general purchasing agent. He held this position until he left for the service in December, 1942.

Mr. Bowen's father, now retired, has a service record with Farrel-Birmingham of 50 years; his uncle also was employed by the company for 60 years.

William R. Bowen

MIDWEST

New Plant for Fractionated Fatty Acids

George A. Eastwood, president of Armour & Co., Chicago, Ill., has announced the issuance by the company of a license to General Mills, Inc., granting rights under Armour patents for General Mills to operate a fats and oils chemical plant for the production of fractionated fatty acids from animal, vegetable, and marine oils. The Armour fractionating processes will be used at the new plant which General Mills recently announced would be built at Kankakee, Ill.

The Armour processes licensed for this use are the result of ten years of research and production development. They enable the separation into their component parts of mixed fatty acids present in fats and oils. After being separated, the fatty acids are converted chemically into new products for which wide use has been found in the manufacture of alkyd resins and other protective coatings, natural and synthetic rubbers, soaps and synthetic detergents, lubricating greases, flotation agents for concentrating the mineral content of ores, and as chemical intermediates. General Mills is the first licensee to enter the new field of organic chemistry of fats and oils opened up by the Armour development.

Monsanto Appointments

Monsanto Chemical Co., St. Louis, Mo., on July 1 advanced Sam R. Clement from assistant general branch managership of its Birmingham sales district, to assistant general managership of sales, phosphate division at St. Louis. Mr. Clement was graduated in 1926 from the Georgia School of Technology and served as Monsanto's resident salesman at Atlanta before he was appointed to his Birmingham sales district position. He was Atlanta salesman for the Swann Chemical Co. from 1931 to 1935, when the company was acquired by Monsanto.

Monsanto has promoted Donald H. Powers, director of textile chemicals sales development in its Merrimac Division at Everett, Mass., to director of the division's textile chemical department. This promotion places Dr. Powers in charge of sales, sales promotion and research activities of the department.

Nate L. Crabtree, former advertising agency executive recently made special assistant to General Manager D. S. Dinsmoor of the Merrimac Division, has been named to take charge of sales promotion activities of the department.

Sawyer Sylvester was made head of the department's technical section.

Ralph Nickerson, authority on cellulose, has been appointed to the textile research department of the Merrimac Division. Dr. Nickerson was formerly associated with the Firestone Tire & Rubber Co., Ecusta Edwards Paper Co., Ludlow Mfg. Sales Co., and Mellon Institute as a senior research fellow. He joins Oscar Cohen, recently appointed to the department.

Monsanto recently named four industrial scientists who will be awarded leaves of absence at full salary for an academic year of study at universities of their choice: Louis P. Wenzell, Jr., Colver P. Dyer, Carlyle John Stehman, and Eli Perry. Mr. Wenzell is a plant investigation group leader in the Monsanto plant in East St. Louis, and Mr. Dyer is a group research leader at the Merrimac division plant in Everett, Mass. Mr. Stehman is a group leader in the Monsanto central research department in Dayton, O., and Mr. Perry, a research engineer in the plastics division plant at Springfield, Mass.

The awards were made by the Monsanto executive committee on the basis of especially meritorious and outstanding scientific work while with the company. The program is applicable to all Monsanto scientific workers in the United States for attendance at universities within the United States. An unspecified number of awards will be made by the committee each year.

Paisley Products, Inc., manufacturer of industrial adhesives, 1770 Canalport Ave., Chicago 16, Ill., has appointed J. F. Sequin its representative in Texas and Oklahoma, with headquarters at 1410 Main St., Dallas 1, Tex. Mr. Sequin, who is well known to the packaging, printing, and manufacturing industries of his territory, brings to his new connection a wide and varied experience in the application of adhesives for industrial fabricating, sealing, labeling, and packaging operations. According to Earl C. Lenz, sales manager of the Paisley Chicago division, this expansion of the company's service organization into the Oklahoma and Texas territory will provide more efficient technical contact between the Paisley laboratory and industries in this area who may require new adhesive applications as an outgrowth of postwar reconversion.

Plant Rubber & Asbestos Works, 537 Brannan St., San Francisco, Calif., will erect in Redwood City, Calif., a new plant of lumber and corrugated sheets, which, together with equipment, will cost approximately $1,000,000.

CANADA

Polymer Corp. Report

Hon. C. D. Howe, Minister of Reconstruction and Supply, in presenting the *annual statement* of Polymer Corp., Sarnia, Ont., to the House of Commons revealed that additional commitments for new facilities at the crown-owned synthetic rubber plant total nearly a million dollars. The statement was for the fiscal year ended March 31, during which the corporation spent $865,166 for new facilities, including $299,947 for a new pilot plant and $167,383 for a new tower for the recovery and concentration of butylene.

The plant, furthermore, now is producing at 18% above designed capacity, or at the rate of 100 million pounds a year.

"During the year Polymer Corp. proved itself as a successful enterprise, capable of standing on its own feet without government subsidy," the minister declared. "It has been preparing long-range plans for the reduction of costs, the expansion of its markets, and additions to certain of its facilities."

A total of 22,392,000 pounds of Butyl was produced by Polymer during the fiscal year. The cumulative total of Butyl production by the end of March, 1946, was 33,266,000 pounds. The output of Buna S (GR-S) for the fiscal year was 78,268,000 pounds, and of Buna S (GR-S) latex, 1,050,000 pounds (dry weight). The cumulative total for Buna S in all forms to the end of March was 179,475,000 pounds.

Said Mr. Howe: "To meet urgent demands from the rubber processing companies the plant has extended itself to produce the last possible ounce of rubber, and the demand for the Sarnia-made types of rubber is at the highest level in the history of the company. Yet, all essential Canadian needs are being met. No one is yet in a position to foresee how long this extraordinary demand will continue, but we are convinced that a substantial demand will be maintained indefinitely."

Mr. Howe mentioned that whereas a year ago Polymer was producing only one type of Buna S, today it is turning out four types, plus three of Buna S latex. In the same period the plant added a new type of Butyl.

"As a result of this new trend, we confidently believe that the Sarnia plant will be able to produce tailor-made types of synthetic rubber for specific purposes," Mr. Howe said. "Thus, the rubber processors will be in a position to work to exact formulae, and this may well result in a host of new rubber articles and in better and cheaper end-products for the consumer."

Mr. Howe's report showed that during the year Polymer reached an agreement with two private companies, Dow Chemical of Canada, Ltd., and Monsanto (Canada), Ltd., for the purchase by these companies of one million pounds of styrene a month for the manufacture of polystyrene. Dow is erecting a $1,000,000 polystyrene plant adjacent to the synthetic rubber plant and Monsanto is constructing a large plant at LaSalle, P. Q.

Mr. Howe also announced the appointment of three new directors to the Polymer board: L. C. McCloskey, H. J. Carmichael, and H. Mero. W. R. Campbell, on the Polymer board since its inception, has resigned. The four remaining directors are: Gilbert LaBine, A. C. Guthrie, A. J. Crawford, and J. A. Hodgson.

A few days previous to presenting the report, Mr. Howe had appeared before the Senate Banking and Commerce Committee and stated that he expected Polymer Corp. would still be operating as a state enterprise five years from now.

Replying to an inquiry by Senator T. A. Crerar, Liberal from Manitoba, Mr. Howe indicated however, that the government is willing to step out of the rubber business if sufficient inducement is offered.

Said Mr. Howe: "If somebody will give us $50,000,000 for the Polymer Corp., we will sell it. We are getting out of business as fast as we can and a lot faster than the United States. Our industry can't operate without rubber, and right now we have no other rubber."

OBITUARY

John C. Treadwell

On July 13 in Green's Farm, Conn., died John C. Treadwell, one-time vice president and general manager of the Intercontinental Rubber Co. and special agent of the United States Government and various rubber companies on rubber surveys in the Far East and the Americas.

Born in Ashtabula, O., 77 years ago, Mr. Treadwell was educated in St. Louis, Mo., and Austin, Tex. After completing his studies at the University of Texas, he went to Mexico where he managed various gold and silver mines.

Then in 1906 the deceased joined the Continental Rubber Co. and in Coahuila, Mexico, began a long career as rubber chemist and planter, devising methods for the extraction of rubber from guayule. As operations became difficult during the Mexican revolution, the company, known in the Orient as Intercontinental Rubber Co., transferred Mr. Treadwell to its newly acquired estate in Sumatra, where he developed for the rubber tree a successful type of contour planting. He also was successful in the control of diseases peculiar to *Hevea* and in devising new methods of grafting to secure a higher yield of latex.

Herbert Hoover, then Secretary of Commerce, sent Mr. Treadwell to survey potential rubber lands in the Western Hemisphere. He also made surveys for Goodyear, Goodrich, and Firestone in Latin America, Sumatra, and the Philippines.

Funeral services were held the evening of July 14 at the Congregational Church of Green Farm's.

Surviving are the widow, two daughters, and three grandchildren.

Edward J. Garrigan

After a six-month illness Edward J. Garrigan, director and vice president in charge of sales of The Okonite Co., Passaic, N. J., died at his home in Rutherford, N. J., on July 4.

Mr. Garrigan was born in New York, N. Y., 62 years ago, and educated in its public schools, later receiving his electrical training at Pratt Institute.

His business career began with the New York Telephone Co.'s engineering department, from which he entered the Western Electric Co. as an electrical inspector. Then at the age of 26 he was appointed general superintendent of the Waterbury Co.'s wire and cable mill and subsequently moved to Schenectady as superintendent of the General Electric Co.'s cable plant there.

Then followed a year or two with the Cosden oil interests in Oklahoma. Mr. Garrigan returned East to become general superintendent of the Habirshaw Electric Cable Corp., where he also served as a sales executive.

In 1924 the deceased joined Okonite and became factory sales manager charged particularly with the responsibility of developing a market for the products of Okonite's newly formed affiliate, The Okonite-Callender Cable Co., Inc., which was established as a separate unit to make paper-insulated power cables for the utilities. In 1937, Mr. Garrigan was elected vice president and sales manager and in 1945 became not only a director of The Okonite Co., but also vice president in charge of sales.

He is survived by his son, a brother, and a sister.

Funeral services were held in Lyndhurst, N. J., on July 6. Interment was in Evergreen Cemetery, Brooklyn, N. Y.

FINANCIAL

Brunswick-Balke-Collender Co., Chicago, Ill., and subsidiaries. First half: net profit, $175,290, equal to 24¢ each on 450,000 common shares, against $111,087, or 10¢ a share, in the initial half last year.

Eagle-Picher Co., Cincinnati, O., and subsidiaries. Six months ended May 31, 1946: consolidated net profit, $898,536.62, equal to $1.01 a common share, contrasted with $767,096.29, or 86¢ a share, for the half year ending in May, 1945; net sales, $19,859,857.84, against $20,632,629.53; provision for income taxes $320,000, against $300,000.

General Electric Co., Schenectady, N. Y. First half, 1946: net loss, $5,980,179, contrasted with net income of $24,793,533, or 86¢ a share, in the first six months of 1945; net sales billed, $222,031,300, against $684,633,672.

Seiberling Rubber Co., Akron, O. First quarter, 1946: net income, $305,510.37, equal, after preferred dividends, to 92¢ a common share, against $156,471.12 in the same period last year.

(*Continued on page 724*)

Patents and Trade Marks

APPLICATION

United States

2,399,183. **In a Tube Clamp Having a Loop of Metal, a Cushion of Rubber-Like Material Bonded to the Inner Surface of the Loop.** R. R. Harrison, North Hollywood, Calif., assignor, by mesne assignments, to Bendix Aviation Corp., South Bend, Ind.

2,399,324. **Soft Ball with a Hollow Center, a Valved Bladder Enclosing the Center, and a Corded Wall Cemented to the Bladder and Including, as a Stiffening Ingredient, Depolymerized Rubber.** J. T. Clark, West Chicago, Ill., assignor to Wintark, Inc., a corporation of Ill.

2,399,326. **Pressure Relief Valve Having an Outwardly Opening Valve Operated by Pneumatically Responsive Means Connected to the Valve.** A. Crot, Topanga, assignor to Lockheed Aircraft Corp., Burbank, both in Calif.

2,399,346. **Collapsible Float for Aircraft.** T. P. Hall and B. Smith, assignors to Consolidated Vultee Aircraft Corp., all of San Diego, Calif.

2,399,444. **In a Hydraulic Accumulator, a Strainer Insert Including a Perforated Disk of Rubber-Like Deformable Material.** J. Mercier, New York, N. Y.

2,399,492. **Shoe Lining Including a Ply of Woven Fabric Carrying on Its Fibers a Rubberized Compound and a Coating in the Form of a Band Solidified from a Molten Mixture of Wax, Rosin, and Rubber Firmly, but Removably Bonded to the Textile Fabric in a Definite Area.** S. P. Lovell, Washington, D. C., and F. H. Russell, Needham, Mass., assignors to Beckwith Mfg., Co., Dover, N. H.

2,399,494. **Life Raft with a Flotation Tube.** F. G. Manson and J. J. Maskey, both of Dayton, O.

2,399,545. **Perforated Adhesive Tape.** B. E. Davis, Brooklyn, N. Y.

2,399,550. **Laminated Resilient Packing for Use between Relatively Reciprocating Male and Female Cylindric Members.** V. G. Klein, assignor to Lincoln Engineering Co., both of St. Louis, Mo.

2,399,572. **Sealing Device for a Tubeless Pneumatic Tire.** E. F. Powell, Wylde Green, and P. W. Badham, Erdington, both of Birmingham, assignors to Dunlop Rubber Co., Ltd., London, both in England.

2,399,628. **In a Composite Spring and Pad Matress Structure Having Separate Upper and Lower Compartments, a Flat Spongy Rubber Pad in the Upper Compartment.** M. M. Cunningham, South Bend, assignor to Mishawaka Rubber & Woolen Mfg. Co., Mishawaka, both in Ind.

2,399,643. **Resuscitation Apparatus.** J. Kreiselman, Washington, D. C.

2,399,647. **In a Heat-Retaining Nursing Bottle Holder with an Insulated Container, a Resilient Rubber Breast Cap and a Rubber Support Means.** L. A. Lockwood, Chicago, Ill.

2,399,670. **Inflatable Flotation Device.** W. H. Freygang, Essex Fells, N. J., assignor to Kidde Mfg. Co., Inc., a corporation of Del.

2,399,712. **In a Nozzle for Intimately Mixing and Ejecting Colloidal Solutions Which Set to Form Inorganic Oxide Hydrogels, the Combination of an Elliptical Rubber Tube and an Elliptical Metal Tube about the Rubber Tube.** E. O. Sowerwine, Jr., Woodbury, N. J., assignor to Socony Vacuum Oil Co., Inc., a corporation of N. Y.

2,399,744. **Flexible Ornamental Fabric Including a Flexible Fabric Backing to Which Is Bonded an Elastic Spiral Plastic Unit Substantially Free from Tension.** L. Kaphan, Brooklyn, N. Y.

2,399,796. **Syringe.** H. Freedman, New York, N. Y.

2,399,879. **In a Hydraulic Accumulator for Storing Fluid under Pressure, a Container within Which Is Secured an Inflatable Spherical Bag.** J. Mercier, New York, N. Y.

2,400,036. **In an Abrasive Article, a Copolymer of Butadiene with Vinylidene Chloride as Bonding Agent.** C. E. Wooddell, G. Van Nimwegen, and E. T. Hager, assignors to Carborundum Co., all of Niagara Falls, N. Y.

2,400,047. **Tire Including an Annular Rope Core, Enclosed by a Sheath, a Flexible Sealing Strip Wound about the Latter, and a Tread Member Wound Helically on the Strip.** M. M. Itscovich, Chicago, Ill.

2,400,089. **In a Bowling Pin of Conventional Form a Chamber and Vent Passage in the Body, and Filling the Chamber, Resilient Material.** W. Henley, Baltimore, Md.

2,400,139. **In a Laminated Glass Product, a Flexible, Tough, Transparent Interlayer of a Polymer Obtained by Polymerizing Ethylene with Vinyl Acetate.** J. R. Roland, assignor to E. I. du Pont de Nemours & Co., Inc., both of Wilmington, Del.

2,400,164. **Shaped Article Including the Direct Deposit of Solids of an Aqueous Dispersion of Butadiene and Styrene; the Dispersion Contains Separately Polymerized Thermoplastic Polyterpene Hydrocarbon Resin Made by the Catalytic Polymerization of Turpentine.** C. R. Peaker, Union City, Conn., assignor to United States Rubber Co., New York, N. Y.

2,400,181. **Rope Including a Plurality of Elements Laid Spirally together; One of the Elements Is a Length of Synthetic Organic Chemical Polymer.** R. F. Warren, Jr., Stratford, Conn.

2,400,238. **In an Oscillatory Joint Radially Inner and Outer Turnable Parts Having Threaded Bearing Engagement. Resilient Bearing Means Arranged to Modify the Action of the Threaded Bearing.** J. W. Leighton, Port Huron, Mich.

2,400,379. **Textile Material for Industrial Use Including a Resin-Impregnated Stiffened Woven Fabric with no Tendency to Curl.** R. C. Whitman, Walpole, assignor to Kendall Co., Boston, both in Mass.

2,400,389. **Laminated Sheet of Rubber Hydrochloride, One Ply of Which Contains an Iodine Carrier and Iodine in a Condition in Which It Is Readily Liberated.** C. J. Cavallito, Rensselaer, N. Y., assignor to Wingfoot Corp., Akron, O.

2,400,390. **Airtight, Vacuum Package, Composed of a Laminated Sheet Including a Metal Foil on the Exterior and Rubber Hydrochloride Film on the Interior.** A. B. Clunan, assignor to Wingfoot Corp., both of Akron, O.

2,400,412. **Rubber Element in a Dimpling Tool.** R. A. Hawn and I. W. Lacher, both of Columbus, O., assignors to Curtiss-Wright Corp., a corporation of Del.

2,400,428. **Non-Skid Tire.** P. R. McCrary, Washington, D. C.

2,400,470. **Weather Strip Including a Bead of Sponge Rubber Having a B-Shaped Outer Surface.** L. Spraragen, assignor to Bridgeport Fabrics, Inc., both of Bridgeport, Conn.

2,400,487. **Composite Sheet Material for Shoe Soles and Other Articles Required to Resist Wear and Slippage, Including a Face Layer of Woven Textile Fabric Having a Ground and a Body of Upstanding Pile Embedded in a Body of Tough, Flexible Rubber Material Superposed and Adherent to the Ground.** F. W. Clark, assignor, by mesne assignments, to Goodall-Sanford, Inc., both of Sanford, Me.

2,400,518. **Electrotype Matrix Molded from a Sheet of Vinyl Acetate-Vinyl Chloride Copolymer.** F. W. Kreber, B. W. Gonser, and R. M. Schaffert, all of Columbus, assignors, by mesne assignments, to Printing Plates Research, Inc., Cleveland, both in O.

2,400,627. **Ventilating Means for Water-Impervious Fabric, Which Includes an Eyelet Secured to the Fabric and a Tube Extending therethrough.** M. A. Chavannes, Kingston, N. Y.

2,400,667. **Conveyer Belt with a Fabric Base Covered with Rubber on Which Is Integrally Formed Transverse Solid Rubber Ribs.** E. E. Toews, assignor to Rub-R-Slat Draper Co., both of Halstead, Kans.

2,400,722. **Syringe Case Having an Open End and a Contracted Portion Intermediate the Ends, and Rubber Plugs in the Contracted Portion and the Open End.** H. L. Swan, Brinkley, Ark.

2,400,809. **In Preparing Bush Material, the Use of a Powdery Thermochangeable Plastic Adhesive.** H. Cave, assignor to Fuller Brush Co., both of Hartford, Conn.

2,401,069. **Spinning Bucket Having a Main Body Portion of Molded Artificial Resin and an Integral Upper Rim Molded of a Laminated Fabric Impregnated with an Artificial Resin.** H. D. Daley, Drexel Hill, Pa., assignor to American Viscose Corp., Wilmington, Del.

2,401,100. **Flexible Power Transmission Member.** S. Pile, assignor to Teleflex Products, Ltd., both of London, England.

2,401,108. **Seal for a Shaft Projecting through a Hole in a Housing.** S. S. Roberts, Pittsburgh, Pa.

2,401,123. **Valve, Including a Body Having a Gate Chamber Extending therethrough, Top and Bottom Flange Closure Plates, and in the Chamber of the Bottom Plate, a Sealing Saddle of Resilient Material.** A. S. Volpin, assignor to Garrott Brass & Machine Co., both of Houston, Tex.

2,401,132. **Composite Plastic Goring.** T. J. Boecker, Melrose, assignor to Herwal Shoe Co., Inc., Everett, both in Mass.

2,401,138. **Resin Bonded Abrasives.** L. Coes, Jr., Brookfield, assignor to Norton Co., Worcester, both in Mass.

2,401,230. **Inflatable Container for Protecting a Body.** R. S. Colley, Kent, O., assignor to B. F. Goodrich Co., New York, N. Y.

2,401,247. **For Preventing Accumulation of Ice on a Propeller Hub of Aircraft, a Streamlined Inflatable Body of Resilient Rubber-Like Material Reinforced by Fabric.** W. H. Hunter, Akron, O., assignor to B. F. Goodrich Co., New York, N. Y.

2,401,252. **Collapsible Umbrella Including a Top Constructed with an Inner and Outer Wall of Flexible Airtight Material, the Edges of Which Are United together; the Whole Is Inflatable to Form the Segment of a Hollow Sphere by Means of a Staff of Inflatable Tubular Material.** E. B. Klimashesky, Minneapolis, Minn.

2,401,257. **Toilet Seat Bumper Including a Sponge Rubber Ball and a Rubber Tube Mounted in an Opening in the Ball.** J. Levine, New York, N. Y.

2,401,260. **Belting Including a Single Ply of Woven Fabric Weighing not More than 45 Ounces a Yard, and a Coating of Rubber Composition.** W. Lord, Rochdale, and H. Riding, Wilmslow, both in England, assignors to Dunlop Tire & Rubber Corp., Buffalo, N. Y.

Dominion of Canada

434,811. **High-Altitude Oxygen Supplying Mask.** A. H. Bulbulian, Rochester, Minn., U.S.A.

434,831. **Adhesive Wear-Resisting Reinforcement Patch for a Garment.** F. M. Prestwich, London, England.

434,917. **In a Device for Fixing and Sealing Tubes in a Partition Wall, Two Elastic Packing Rings.** Sulzer Frère, S.A., assignee of W. Huber, both of Winterthur, Switzerland.

434,966. **Infusible Resinous Cation Exchange Body.** Canadian General Electric Co., Ltd., Toronto, Ont., assignee of G. F. D'Alelio, Pittsfield, Mass., U.S.A.

434,973. **Traveler, the Wearing Surface of Which Includes a Plasticized Cellulose Ester.** Clark Thread Co., Newark, assignee of W. M. Camp, Glen Ridge, both in N. J., U.S.A.

434,974. **Traveler, the Wearing Surface of Which Includes a Vinyl Ester Polymer.** Clark Thread Co., Newark, assignee of W. M. Camp, Glen Ridge, both in N. J., U. S. A.

434,975. **Traveler, the Wearing Surface of Which Includes an Acrylic Polymer.** Clark Thread Co., Newark, assignee of W. M. Camp, Glen Ridge, both in N. J., U.S.A.

434,976. **Traveler, the Wearing Surface of Which Is a Vinylidene Chloride Polymer.** Clark Thread Co., Newark, assignee of W. M. Camp, Glen Ridge, both in N. J., U. S. A.

434,977. **Traveler, the Wearing Surface of Which Is Polystyrene.** Clark Thread Co., Newark, assignee of W. M. Camp, Glen Ridge, both in N. J., U. S. A.

434,978. **Traveler, the Wearing Surface of Which Includes a Water Insoluble Cellulose Ether.** Clark Thread Co., Newark, assignee of W. M. Camp, Glen Ridge, both in N. J., U. S. A.

434,982. **Collapsible Cooking Receptacle Made from a Sheet of Fabric with a Heat Resistant Plastic Coating.** Dominion Rubber Co., Ltd., Montreal, P. Q., assignee of B. H. Foster, Maplewood, N. J., U. S. A.

434,992. **Composite Article of Vulcanizable Rubber or Rubber-Like Material Strongly Bonded to a Corodible Material.** Honorary Advisory Council for Scientific & Industrial Research, assignee of T. R. Griffith, both of Ottawa, Ont.

435,020. **Diaphragm for Use in a Diaphragm Valve Including a Sheet of Flexible Rubber-Like Material.** Saunders Valve Co. of Canada, Ltd., New York, assignee of P. K. Saunders, Mamaroneck, both in N. Y., U. S. A.

435,041. **Brake-Shoe Spring Arrangement.** Wingfoot Corp., assignee of C. E. Bricker, both of Akron, O., U. S. A.

435,046. **One-Piece, Preformed Outer Shoe Sole of Sponge Rubber.** B. Jayne, Woodhaven, N. Y., and D. J. Calderazzo, assignee of one-half of the interest, South Orange, N. J., both in the U. S. A.

435,076. **Strainer Insert for Hydraulic Accumulators, Including a Perforated Disk of Rubber-Like Material.** J. Mercier, New York, N. Y., U. S. A.

435,095. **A Seam Adapted to Be Dry Constructed between Layers of Paper or Fabric, Including a Length of Homogeneous Moisture-Proof Permanently Flexible Thermoplastic Material between the Layers.** Bemis Bros. Bag Co., assignee of A. F. Ottinger, both of St. Louis, Mo., U. S. A.

435,131. **Cellular-Rubber Covered Spring Cushion.** Dunlop Tire & Rubber Goods Co., Ltd., Toronto, Ont., assignee of F. O. Church, Buffalo, N. Y., U. S. A.

435,136. **In a Hydraulic Structure, a Sealing Element Consisting of a Tubular Body of Resilient Elastic Material.** Houdaille-Hershey Corp., Detroit, Mich., assignee of H. L. Chisholm, Jr., Buffalo, N. Y., U. S. A.

435,149. **Mattress with a Spring Construction Enclosed in a Cellular, Resilient, Elastic Body Having an Exterior Skin-Like Sealing Surface.** M. Marsack, Milwaukee, Wis., U. S. A.

435,185. **Bowling Alley Bed Including a Solid and Non-Resilient Base, a Rubber Layer**

thereon, and a Metal Surface Secured on the First Layer. J. A. Mathieu and L. Chevalier assignee of one-half of the interest, both of Quebec, P. Q.

435,210. **A Garment with a Waistband Having a Pocket and Disposed therein, the Elastic Portion of a Sizing Member.** I. J. Lyons, Montreal, P. Q.

435,288. **In Means to Prevent Escape of Fluid from between Two Parts, a Seal of Resilient Material.** Smith's Jacking Systems, Ltd., assignee of D. W. Sessions, both of London, England.

United Kingdom

577,020. **Abrasive Compositions.** Norton Grinding Wheel Co., Ltd.

577,021. **Aromatic Amine-Aldehyde Resinous Products.** Norton Grinding Wheel Co., Ltd.

577,096. **Reservoir Pens, Stylographs, Etc.** W. L. Colassi and R. Lansdown.

577,214. **Protective Clothing Equipment for Seamen.** J. R. C. Quilter and B. J. Ferre.

577,356. **Vibration Dampers.** Metalastik, Ltd., D. Napier & Son, Ltd., and D. Zdanowich.

577,359. **Arrangements for Preventing Electrolysis Corrosion of Underground Cables and the Like.** Standard Telephone & Cables, Ltd.

577,360. **Waterproof Cord Fuzes.** R. D. J. Owens and Imperial Chemical Industries, Ltd.

577,411. **Brake and Clutch Apparatus.** Dunlop Rubber Co., Ltd., and H. J. Butler.

577,435 **Self-Contained Breathing Apparatus.** Siebe, Gorman & Co., Ltd., and R. H. and R. W. G. Davis.

577,506. **Paper Bags.** Wingfoot Corp.

577,521. **Vehicle Tires.** Henley's Tire & Rubber Co., Ltd., and E. C. Woods.

PROCESS

United States

2,399,338. **Rapidly Building Tubular Laminated Structures from a Heavy Sheet of Fibrous Cellulosic Material Coated with Polyvinyl Alcohol on One Surface.** J. G. Ford, Sharon, Pa., assignor to Westinghouse Electric Corp., East Pittsburgh, Pa.

2,399,592. **Molded Thermoplastic Hollow Article with Thin-Walled Sections.** R. R. Bradshaw, assignor to Dow Chemical Co., both of Midland, Mich.

2,400,091. **Porous Articles of Polytetrafluoroethylene.** J. Alfthan, New York, N. Y., assignor to E. I. du Pont de Nemours & Co., Inc., Wilmington, Del.

2,400,099. **Articles of Polytetrafluoroethylene.** M. M. Brubaker, Boothwyn, and W. E. Hanford, Easton, both in Pa., assignors to E. I. du Pont de Nemours & Co., Inc., Wilmington, Del.

2,400,533. **Cup Packing from Fabric First Treated with a Methyl Cellulose Solution and Then Impregnated with a Vulcanizable Rubber Cement.** M. R. Buffington, Milburn, assignor to Lea Fabrics, Inc., Newark, both in N. J.

2,400,576. **Deposition of Rubber on the Windings of Magnetizable Cores.** F. J. Sigmund and W. S. Hlavin, Cleveland, O., assignors, by mesne assignments, to Sigmund Corp., a corporation of O.

2,400,918. **Rubber-Coated Airplane Wings or Fins.** V. A. Cosler, assignor to E. I. du Pont de Nemours & Co., Inc., both of Wilmington, Del.

2,400,973. **Rubber Wheel Having an Inner Supporting Means.** J. B. Bennett, Los Angeles, and J. J. McCarter, Alhambra, both in Calif., assignors by mesne assignments, to Thermoid Co., Trenton, N. J.

2,400,990. **Porous Coated Fabrics.** T. G. Hawley, Jr., Naugatuck, Conn., assignor to United States Rubber Co., New York, N. Y.

2,401,045. **Renewable Tread Tire.** A. E. Brickman, New Haven, Conn., assignor to American Steel & Wire Co., of New Jersey, a corporation of N. J.

2,401,180. **Thin, but Rigid Cup-Like Molded Plastic Articles.** W. H. Parmelee, Bethel Township, assignor to Wheeling Stamping Co., Wheeling, both in Pa.

Dominion of Canada

434,858. **Stretching Process for a Cast Rod of Polymethyl Methacrylate.** Canadian Industries Ltd., Montreal, P. Q., assignee of F. J. Fielitz, Bellesville, and B. M. Marks, Newark, both in N. J., U. S. A.

434,983. **Producing by a Continuous Operation a Relatively Stiff Resin-Impregnated Sheet Having Hard Smooth Surfaces.** Dominion Rubber Co., Ltd., Montreal, P. Q., assignee of R. M. Paulsen, Mishawaka, Ind., U. S. A.

434,984. **Subjecting Filaments of a Normally Crystalline Vinylidene Chloride Polymer in the Supercooled State to the Simultaneous Operations of Stretching and False Twisting.** Dow Chemical Co., assignee of A. W. Hanson, both of Midland, Mich., U. S. A.

434,986. **Extruded Thermoplastic Articles.** Extruded Plastics, Inc., Newark, assignee of C. E. Slaughter, New Canaan, both in N. J., U. S. A.

434,990. **Cutting Relatively Thick Stock of Rubber or the Like.** General Tire & Rubber Co., assignee of M. Engler, both of Akron, O., U. S. A.

434,991. **Composite Articles of Rubber Bonded to Metal.** Honorary Advisory Council for Scientific & Industrial Research, assignee of T. R. Griffith, both of Ottawa, Ont.

434,997. **Forming Pezzer-Type Catheters of Rubber, Etc.** Lee Rubber & Tire Corp., assignee of R. J. Limbert and C. J. Glaser, all of Conshohocken, Pa., U. S. A.

435,075. **Rubber Accumulator Bags.** J. Mercier, New York, N. Y., U. S. A.

435,129. **Bonding Butyl to Other Surfaces.** Dominion Rubber Co., Ltd., Montreal, P. Q., assignee of W. H. Hulswit, Jr., and H. C. Weichman, both of Detroit, Mich., U. S. A.

435,130. **Adhering Rubber Firmly to Metal.** Dominion Rubber Co., Ltd., Montreal, P. Q., assignee of A. J. Saulino, Detroit, Mich., U. S. A.

435,140. **Insulating Electrical Apparatus with Rubber.** Jefferson Electric Co., Bellwood, Ill., assignee of A. D. Little, Inc., Cambridge, assignee of M. Omansky, Brookline, both in Mass., both in the U. S. A.

435,192. **Corrugated Tube of Rubber or Rubberized Material.** F. T. and R. E. Roberts, both of Ridgefield, Conn., U. S. A.

United Kingdom

577,291. **Uniting Rubber to Textiles.** Callender's Cable & Construction Co., Ltd., G. M. Hamilton and C. T. Suchy.

577,373. **Molding Thermosetting Materials.** F. K. Goldhard and D. D. Prenn.

577,390. **Covering or Tread Surface on a Pulley, Wheel, Roller, Etc.** Ferodo, Ltd., and J. Billington.

577,575. **Processing Rubber Substances.** Sussex Rubber Co., Ltd., and F. S. Breuer.

577,640. **Bonding Rubber to Metal or Other Rigid Components.** John Bull Rubber Co., Ltd., Metalastik, Ltd., and C. M. Blow.

CHEMICAL

United States

2,399,164. **Production of Unsaturated Hydrocarbons by the Dehydration of a Polyhydroxy Compound.** J. E. Bludworth, Cumberland, Md., assignor to Celanese Corp. of America, a corporation of Del.

2,399,179. **Coating Composition Prepared by Heating to Polymerization Temperature a Mixture of an Unsaturated Glyceride Oil and a Diene Hydrocarbon of from 1 to 5 Cyclic C_5H_6 Groups per Molecule in the Presence of a Resin Soluble therein.** H. L. Gerhart, Milwaukee, Wis., assignor to Pittsburgh Plate Glass Co., Pittsburgh, Pa.

2,399,208. **Making a Planographic Printing Plate by Coating a Suitable Base with a Completely Hydrolyzed Vinyl Acetate-Ethylene Polymer and Selectively Locating Grease-Receptive Printing Layers on the Interpolymer Surface.** C. Coolidge, assignor to E. I. du Pont de Nemours & Co., Inc., both of Wilmington, Del.

2,399,214. **Convertible Alkyd Resin.** T. W. Evans, Oakland, and D. E. Adelson, Berkeley, assignors to Shell Development Co., San Francisco, all in Calif.

2,399,262. **Softening a Solid Plastic Hydrocarbon Interpolymer Compound Which Is Reactive with Sulphur to Give an Elastic Product.** R. M. Thomas, Union, and F. P. Baldwin, Pluckemin, both in N. J., assignors, by mesne assignments, to Jasco, Inc., a corporation of La.

2,399,286-287. **Unsaturated Esters and Polymers thereof.** I. E. Muskat, Glenside, Pa., and F. Strain, Norton Center, O., assignors to Pittsburgh Plate Glass Co., Pittsburgh, Pa.

2,399,330. **Polyvinyl Acetal Plastic Composition Containing 1,4-Diphenoxybutene-2.** G. F. Deebel, Dayton, O., assignor to Monsanto Chemical Co., a corporation of Del.

2,399,395. **Making Styrene by Passing Phenyl Methyl Carbinol in the Vapor Phase over a Mechanically Strong, Pelleted Titania Catalyst.** L. C. Shriver, South Charleston, W. Va., assignor to Carbide & Carbon Chemicals Corp., a corporation of N. Y.

2,399,401. **Composition of Polyvinyl Alcohol Plasticized with Benzaldehyde and Glycerol.** H. M. Sonnichsen, and R. F. Gager, both of Niagara Falls, N. Y., assignors to E. I. du Pont de Nemours & Co., Inc., Wilmington, Del.

2,399,407. **In Preparing Interpolymers of Chloroprene with Vinylidine Compounds by Emulsion Polymerization, the Step of Adding an Aliphatic 1,3-Butadiene Hydrocarbon.** F. C. Wagner, Louisville, Ky., assignor to E. I. du Pont de Nemours & Co., Inc., Wilmington, Del.

2,399,456. **Plasticizing Polymerized Vinyl Alcohol by Admixing in the Solid State with Solid Polyoxymethylene Glycol.** E. S. Yates and R. F. Gager, both of Niagara Falls, N. Y., assignors to E. I. du Pont de Nemours & Co., Inc., Wilmington, Del.

2,399,489. **Coating Composition Including a Mineral Pigment, an Alkali Metal Poly-Phosphate Dispersing Agent, Starch, a Member of the Group of Acid-Curing Urea-Aldehyde and Melamine-Aldehyde Condensation Products and an Acidic Curing Catalyst for the Condensation Product.** C. G. Landes, New Canaan, Conn., assignor to American Cyanamid Co., New York, N. Y.

2,399,514. **Purifying a Colored Light Oil Styrene Fraction Contaminated with Phenyl Acetylene.** E. H. Smoker, Drexel Hill, Pa., assignor to United Gas Improvement Co., a corporation of Pa.

2,399,558. **Composition Including Organic Polymeric Adhesive Material from the Group of Natural and Synthetic Hydrocarbon Base Rubbers in a Solvent Including a Major Proportion of a Branched Chain Paraffin Containing from 5 to 9 Carbon Atoms.** E. H. McArdle, Linden, and A. E. Robertson, Roselle, both of N. J., assignors to Standard Oil Development Co., a corporation of Del.

2,399,626. **Copolymer of an Ethenyloxyacetic Acid Ester with a Polymerizable Olefin Hydrocarbon.** D. D. Coffman, Lindamere, assignor to E. I. du Pont de Nemours & Co., Inc., Wilmington, both in Del.

2,399,653. **Obtaining a Solid Macromolecular, Partially Hydrolyzed Ethylene/Vinyl Acetate Interpolymer.** J. R. Roland, Jr., assignor to E. I. du Pont de Nemours & Co., Inc., both of Wilmington, Del.

2,399,655. **Composition Consisting of a Rubber Accelerator Mixed with Bentonite.** W. H. Alton, Westport, Conn., assignor to R. T. Vanderbilt Co., Inc., New York, N. Y.

2,399,672. **Improved Process for Preparing Solid Rubber-Like Materials by Polymerizing an Isomonoolefin in an Alkyl Chloride Diluent.** A. D. Green, Cranford, S. C. Lane, Roselle, and E. T. Marshall, Cranford, both in N. J., assignors, by mesne assignments, to Jasco, Inc., a corporation of La.

2,399,684. **Liquid Vinyl Resin Dispersion Which Can Be Blended with Rubber Latex to Form a Stable Emulsion Capable of Controlled and Uniform Coagulation.** G. P. Mack, Jackson Heights, assignor to Advance Solvents & Chemical Corp., New York, both in N. Y.

2,399,692. **Fusible, Soluble Alkyd Resin Obtained by Simultaneous Heating of a Polymerized Rosin, an α,β- Unsaturated Organic Polycarboxylic Acid, and a Polyhydric Alcohol.** E. G. Peterson, assignor to Hercules Powder Co., both of Wilmington, Del.

2,399,694. **Preparing a Viscous Liquid to Plastic Composition Compatible with Synthetic rubber and Containing 5 to 35% Sulphur in a Form Available for Vulcanization.** F. S. Rostler, H. W. Sternberg, and H. I. du Pont, assignors to Wilmington Chemical Corp., all of Wilmington, Del.

2,399,735. **Producing a Resin by Reacting an Aldehyde from the Group of Formaldehyde, Paraformaldehyde, Trioxymethylene, and Furfuraldehyde, with a Chlorinated Phenol.** M. T. Harvey, South Orange, N. J., assignor to Harvel Corp., a corporation of N. J.

2,399,804. **Gasket Material Resistant to Petroleum and Organic Solvents and Provided with an Elastomeric Surface.** L. H. Hills and A. L. Gordon, assignors to Vellumoid Co., all of Worcester, Mass.

2,399,837. **Recovering an Aliphatic Conjugated Diolefin from a Monosulfone thereof.** J. D. Upham, Bartlesville, Okla., assignors to Phillips Petroleum Co., a corporation of Del.

2,399,895. **Treating a Hydrocarbon Fraction Including a C_4 Paraffin and a C_4 Monoolefin to Cause the Isomerization of Substantial Amounts of C_4 Monoolefins and the Formation of Substantial Amounts of C_4 Diolefin.** W. D. Seyfried, Wooster, and S. H. Hastings, Baytown, both in Tex., assignors to Standard Oil Development Co., a corporation of Del.

2,399,945. **Vulcanizable Compound Including a Rubber-Like Copolymer of Butadiene and Styrene, a Copper Salt of a Dialkyldithiocarbamic Acid as Accelerator, and Sulfur in an Amount Exceeding That Required to Convert All of the Copper in the Copper Salt to Cupric Sulfide.** A. A. Somerville, Carmel, assignor to R. T. Vanderbilt Co., Inc., New York, both in N. Y.

2,399,946. **Vulcanizable Compound Including a Copolymer of Butadiene and Styrene a Mix-**

ture of Bitumen and an Oil Soluble Copper Soap, and Sulfur in an Amount Exceeding That Required to Convert All of the Copper to Cupric Sulfide. A. A. Somerville, Carmel, assignor to R. T. Vanderbilt Co., Inc., New York, both in N. Y.

2,399,947. Vulcanizable Compound Including a Copolymer of Butadiene and Styrene, a Chemically Inert Filler Carrying a Copper Salt, and Sulfur in an Amount Exceeding That Required to Convert All of the Copper to Cupric Sulfide. A. A. Somerville, Carmel, assignor to R. T. Vanderbilt Co., Inc., New York, both in N. Y.

2,399,948. Vulcanizable Compound Including a Copolymer of Butadiene and Styrene, a Copper Salt of Mercaptobenzothiazole as Accelerator, and Sulfur in an Amount Exceeding That Required to Convert All of the Copper in the Copper Salt to Cupric Sulfide. A. A. Somerville, Carmel, assignor to R. T. Vanderbilt Co., Inc., New York, both in N. Y.

2,399,949. Vulcanization Product of a Copolymer of Butadiene and Styrene Containing a Material of the Class of Metallic Copper and Compounds of Copper as Accelerator, Sulfur, and a Compound of the Class of Thiuram Sulfides and Dithiocarbamates as Accelerator. A. A. Somerville, Carmel, assignor to R. T. Vanderbilt Co., Inc., New York, both in N. Y.

2,399,970. Producing Filaments, Threads, and the Like of Polyvinyl Alcohol. D. L. Wilson, Coventry, assignor to Courtaulds, Ltd., London, both in England.

2,400,016. Synthetic Resin Coating Consisting of a Suspension Including a Volatile Liquid Vehicle, Finely Divided Cellulosic Material and Intermediate Reaction Products of Formaldehyde with Urea and a Substance from the Group of Diureido Alkanes. L. S. Meyer, assignor to Libbey-Owens-Ford Glass Co., both of Toledo, O.

2,400,029. Copolymer of Butadiene and Acrylonitrile Containing a Material from the Class of Metallic Copper and Compounds of Copper Effective as Accelerator, and in Excess of 50% by Weight on the Copper of Sulfur. A. A. Somerville, Carmel, assignor to R. T. Vanderbilt Co., Inc., New York, both in N. Y.

2,400,054. Polydispersion Containing Synthetic Rubber and Separate Particles of the Reaction Product of an Oil-Modified Alkyd Resin and an Organic Solvent-Soluble Urea-Formaldehyde - Alcohol Condensate. J. D. Robinson, Painesville, O., and F. J. Myers, assignors to Resinous Products & Chemical Co., both of Philadelphia, Pa.

2,400,057. Vulcanization Product of a Copolymer of Butadiene and Styrene Containing about 0.005-1% (Calculated as Copper) by Weight on the Copolymer of a Material of the Class of Metallic Copper and Compounds of Copper Effective as Accelerator, and in Excess of 50% by Weight on the Copper of Sulfur. A. A. Somerville, Carmel, assignor to R. T. Vanderbilt Co., Inc., New York, both in N. Y.

2,400,129. In a Low-Temperature Polymerization Process, the Steps, in Combination, of Chilling Carbon-Disulfide to a Temperature between -10 and -150 C°, Dissolving therein a Major Proportion of Isobutylene and a Minor Proportion of a Conjugated Diolefin, Adding a Friedel-Crafts Catalyst, and Polymerizing. J. F. Nelson, Elizabeth, and A. B. Small, Roselle, both in N. J., assignors to Standard Oil Development Co., a corporation of Del.

2,400,288. Nitrating Ethyleneurea by Treating with a Solution of Nitrogen Pentoxide Dissolved in a Non-Aqueous Solvent. G. V. Caesar, Staten Island, and M. Goldfrank, assignors to Stein, Hall & Co., both of New York, both in N. Y.

2,400,333. Composition Including a Polyvinyl Acetal and a Glycidal Ether of Glycerol. F. A. Bent, Berkeley, and K. E. Marple, Oakland, assignors to Shell Development Co. San Francisco, all in Calif.

2,400,340. Separating Olefins from a Predominantly C_4 Feed Stock. J. H. Cone, Goose Creek, Tex., assignor to Standard Oil Development Co., a corporation of Del.

2,400,350. Recovering Normal Butylenes from a C_4 Fraction Containing Them in Admixture with Isobutylene and Butanes. I. D. Hall, Baytown, Tex., assignor to Standard Oil Development Co., a corporation of Del.

2,400,370. Directly and Continuously Preparing in the Pure State, Butyl Alcohol, Acetone, and Ethyl Alcohol from Dilute Watery Solutions. A. Placek, Philadelphia, assignor to Acme Coppersmithing & Machine Co., Oreland, both in Pa.

2,400,393. New Composition Including a Member of the Class of Oxyalkylated Lower Alkyl Esters of a Polymerized Polyethylenic Higher Fatty Acid and Oxyalkylated Sulfurized Lower Alkyl Esters of a Polymerized Polyethylenic Higher Fatty Acid. M. De Groote, University City, Mo., assignor to Petrolite Corp., Ltd., Wilmington, Del.

2,400,453. Cellulose Acetate Butyrate Coating Composition. C. Bogin, assignor to Commercial Solvents Corp., both of Terre Haute, Ind.

2,400,463. Producing Trichloropropionic Acid by Hydrolyzing Trichloropropionitrile in a Sulphuric Acid Bath. J. G. Lichty, Stow, assignor to Wingfoot Corp., Akron, both in O.

2,400,464. Producing Methyl-Beta-Chloroacrylate by Heating a Dichloropropionic Acid and Methanol. J. G. Lichty, Stow, assignor to Wingfoot Corp., Akron, both in O.

2,400,477. Polymerizing Alkyl Acrylates. F. C. Atwood, Newton, Mass., assignor, by mesne assignments, to National Dairy Products Corp., New York, N. Y.

2,400,500. Condensation Product of a 1,2-Dihydroquinoline with a Diarylamine in the Presence of an Acidic Condensation Catalyst from the Group of Strong Acids and Hydrolyzable Compounds of Strong Acids. C. F. Gibbs, Cuyahoga Falls, O., assignor to B. F. Goodrich Co., New York, N. Y.

2,400,520-521. Process for the Conjunct Polymerization of an Olefin to Produce Saturated Hydrocarbon Polymers and Terpene-Like Unsaturated Hydrocarbons. C. S. Kuhn, Dallas, Tex., assignor, by mesne assignments, to Socony-Vacuum Oil Co., Inc., New York, N. Y.

2,400,565. An Elasto-Plastic Sash Glazing Composition Including Reclaimed Rubber, Wood Rosin, Cumar, Powdered Whiting, and Asbestos Fiber Dispersed in a Hydrocarbon Solvent. G. S. Merrill, assignor to Minnesota Mining & Mfg. Co., both of St. Paul, Minn.

2,400,578. Synthetic Rubber-Like Materials Produced by the Emulsion Polymerization of a Mixture of a Compound from the Group of Styrene and Methyl Substituted Styrenes with a Mixture of Isoprene and Butadiene-1,3. B. M. Vanderbilt, Westfield, N. J., and H. J. Rose, East Baton Rouge, La., assignors to Standard Oil Development Co., a corporation of Del.

2,400,612. Liquid Adhesive Composition Including Plastic Polymerized Chloroprene Dissolved in an Organic Solvent, and Including Polyvinyl Acetate in Solution; the Polyvinyl Acetate Acts to Impart Initial Tackiness to the Mixture While the Strength of the Polymerized Chloroprene Bond Is Being Developed. S. L. Sprague, Westwood, Mass., assignor to B. B. Chemical Co., Boston, Mass.

2,400,718. Reactive Phenol-Aldehyde Resins. E. F. Siegel, Elizabeth, N. J., assignor to Reichhold Chemicals, Inc., Detroit, Mich.

2,400,720. Producing a Hydrophilic Surface on an Object Made from a Hydrophilic Polymer Containing Aromatic Nuclei. H. P. Staudinger, Ewell, and H. M. Hutchinson, Banstead, both in England, assignors to Distillers Co., Ltd., Edinburgh, Scotland.

2,400,774. Simultaneous Production of Styrene and Butadiene. G. A. Nesty, Syracuse, and W. C. Klingelhoefer, Baldwinsville, assignors to Solvay Process Co., New York, all in N. Y.

2,400,806. Resinous Combustible Condensation Product of 2,4,6-Trinitrotoluene Formaldehyde, and a Member of the Group of Ammonia and Primary, Strongly Basic N-Methylol-Forming, Aliphatic and Alicyclic Amines. H. A. Bruson and G. B. Butler, assignors to Rohm & Hass Co., all of Philadelphia, Pa.

2,400,808. Aqueous Dispersion of Vinyl Chloride Polymer Free from OH Groups. E. R. Burns, Cheshire, Conn., assignor, by mesne assignments, to Dispersions Process, Inc., New York, N. Y.

2,400,873. An Acid-Catalyzed Addition-Rearrangement Product of Dicyclopentadiene and a Hydroxycarboxylic Acid Ester. H. A. Bruson, assignor to Resinous Products & Chemical Co., both of Philadelphia, Pa.

2,400,892. Plastic Composition Including a Resinous Polymer of a Compound from the Group of Styrene and Nuclear Substituted Methyl Styrene and a Plasticizer from the Group of Cyclohexyl Naphthenate and Cyclohexyl Stearate. F. J. Soday, Baton Rouge, La., assignor to United Gas Improvement Co., a corporation of Pa.

2,400,957. Preparing a Polyvinyl Acetal Resin by the Condensation Reaction of an Aldehyde Containing from 2 to 4 Carbon Atoms with Polyvinyl Alcohol Containing up to 30% of Unhydrolyzed Polyvinyl Ester in a Preponderantly Water Solution. G. S. Stamatoff, Rutherford, N. J., assignor to E. I. du Pont de Nemours & Co., Inc., Wilmington, Del.

2,401,015. Liquid Adhesive Composition Including Plastic Polymerized Chloroprene and Zinc Calcium Resinate in a Volatile Organic Solvent. J. L. Perkins, Arlington, assignor to B. B. Chemical Co., Boston, both in Mass.

2,401,027. Preparing a Rubber Deposit by Association of an Aqueous Dispersion of Rubber Having Positively Charged Particles Stabilized with a Cationic Soap and Containing an Added Coagulating Chemical Which Coagulates Negatively Charged Particles, with a Second Rubber Dispersion Having Negatively Charged Particles Stabilized with an Anionic Soap and Containing an Added Coagulating Chemical Which Coagulates only Positively Charged Particles. H. W. Tausch, assignor to American Anode Co., both of Akron, O.

2,401,099. Reacting 1,3-Dienes with Polyhalogenated Alkanes in the Presence of a Polyhydroxy Benzene, a Peroxygen Compound and Iron to Obtain Terminally Halogen Substituted Alkenes Containing from One to 2 Units of a Diene. W. R. Peterson, assignor to E. I. du Pont de Nemours & Co., Inc., both of Wilmington, Del.

2,401,102. Preparation of Synthetic Resinous Products Insoluble in Benzol from Phenol, Formaldehyde, and Oxidized Rubber. F. J. W. Popham, New Barnet, assignor to British Rubber Producers' Research Association, London, both in England.

2,401,133. Producing Chlorinated Rubber Containing 62 to 70% Chlorine and Having High Initial and Permanent Flexibility When in the Form of an Unplasticized Film. F. J. Bouchard, Blacksburg, Va., assignor to Hercules Powder Co., Wilmington, Del.

2,401,155. Higher Molecular Sulfamide Compound Containing a Syanur Nucleus. W. Hentrich, Rodleben, and E. Schirm, Dessau, both in Germany; vested in the Alien Property Custodian.

2,401,194. Producing Chlorinated Rubber Containing about 62 to 70% Chlorine and Having High Initial and Permanent Flexibility When in the Form of an Unplasticized Film. E. J. Schlenk, Milltown, N. J., assignor to Hercules Powder Co., Wilmington, Del.

2,401,266. Low-Power Factor Electrical Insulating Composition Including a Mixture of Polymerized Styrene of Molecular Weight 80,000 and Polymerized Alpha Methyl Styrene of Viscosity between 100 and 2000 Centistokes at 100° F. A. A. New, London, England, assignor to International Standard Electric Corp., New York, N. Y.

2,401,282. Separating into Its Components a Narrow-Boiling Range Mixture of Cyclopentene and Piperylene. C. E. Welling, Bartlesville, Bartlesville, Okla., assignor to Phillips Petroleum Co., a corporation of Del.

Dominion of Canada

434,851. Resinous Cation Exchange Body Which Is the Reaction Product of a Phenol, and Aldehyde, and a Partial Amide of a Polycarboxylic Acid Containing at Least One—COOH Radical and at Least One—$CONH_2$ Radical. Canadian General Electric Co., Ltd., Toronto, Ont., assignee of G. F. D'Alelio, Pittsfield, Mass., U.S.A.

434,857. Dope for Treating Fabrics, Including a Solution in a Suitable Volatile Solvent of the Material Obtained by Chlorinating Solid Polythenes at a Temperature Generally below 60° C. to a Chlorine Content of 60 to 70% by Weight. Canadian Industries, Ltd., Montreal, P.Q., assignee of J. R. Myles and D. Whittaker, both of Northwich, Cheshire, and F. J. Siddle, Blackley, Manchester, all in England.

434,860. Oil- and Grease-Resistant Heat Sealable Film Including a Base Coated on at Least One Side with a Composition Consisting of Polyvinyl Acetate, Nitrocellulose, and Di(Ethylene Glycol Monomethyl Ether) Phthalate. Canadian Industries, Ltd., Montreal, P.Q., assignee of J. A. Mitchell, Kenmore, and D. D. Lanning, Williamsville, both in N.Y., U.S.A.

434,861. Coating a Preformed Plastic Article of Polymethyl Methacrylate with a Composition Including a Photopolymerizable Methacrylate Possessing but One Vinyl or Vinylidene Group, Photopolymerizable Methacrylate Possessing Two Terminal Ethylenic Groups, at Least One of Which Is Conjugated with Another Multiple Bond in the Molecule, and an Acyloin. Canadian Industries, Ltd., Montreal, P.Q., assignee of B. W. Howk, Wilmington, Del., and R. A. Jacobson, Landenberg, Pa., both in the U.S.A.

434,862. Solution of a Synthetic Linear Polyamide in a Mono-Nitro Derivative of a Mono-Hydric Aliphatic Alcohol of 2 to 8 Carbon Atoms.. Canadian Industries, Ltd., Montreal, P.Q., assignee of W. W. Watkins, Buffalo, N. Y., U.S.A.

434,892. Insulating Material Consisting of Rubber, Mica, and Sulphur. Jefferson Co., Bellwood, Ill., assignee of A. D. Little, Inc., Cambridge, assignee of C. G. Harford, Wollaston, both in Mass., U.S.A.

434,924. Improving the Clarity of Cellulose Ethers. C. G. Board, London, England, administrator of the estate of H. Dreyfus, decreased, in his lifetime of London, England, assignee of J. H. Sharphouse, P. R. Hawtin, J. Downing, and W. H. Groombridge, all of Spondon, England.

434,925. Process for the Oxidation of Organic Compounds Oxidizable by Means of Lead Tetracetate. C. G. Bonard, London, England, administrator of the estate of H. Dreyfus, deceased, in his lifetime of London, England, assignee of J. G. N. Drewitt, London, England.

434,970. Reacting the Surface of a Preformed Cellulose Compound with Acrylonitrile in the Presence of an Inorganic Alkaline Catalyst. Canadian Industries, Ltd., Montreal, P.Q., assignee of R. C. Houtz, Snyder, N. Y., U.S.A.

434,987. Insulating Material Consisting of a Mixture of Comminuted Insoluble Polystyrene in a Matrix of Plasticized Polystyrene. Federal Telephone & Radio Corp., New York, N.

Y., assignee of A. J. Warner, South Orange, N. J., both in the U.S.A.

434,988. **Cement Including a Water Soluble, Partial Condensation Product of Urea-Formaldehyde, Soybean Meal Impregnated with a Cured Phenol Formaldehyde Resin, and Monoammonium Phosphate.** Ford Motor Co. of Canada, Ltd., Windsor, Ont., assignee of H. Ford and R. A. Boyer, both of Dearborn, and P. J. Beyer, Detroit, both in Mich., U.S.A.

434,995. **Electric Insulating Material Consisting of Polystyrene Mixed with an Organic Chemical Compound Having a Molecular Weight between 160 and 480, Melting Point Not Higher than 70° C. and a Boiling Point Not Less Than 240° C.** International Standard Electric Corp., New York, N. Y., U.S.A., assignee of A. A. New, London, England.

434,996. **Electric Insulating Material Consisting of a Mixture of Polystyrene and a Symmetrical Halogenated Hydrocarbon (Excluding Fused Ring Compounds Such as Derivatives of Naphthalene and Anthracene and Joined Ring Compounds Such as Derivatives of Diphenyl).** International Standard Electric Corp., New York, N. Y., U.S.A., assignee of A. A. New, London, England.

435,038. **Copolymer of Vinyl Chloride, Vinylidene Chloride, and Vinyl Acetate.** Wingfoot Corp., assignee of W. Scott, both of Akron, and R. B. Seymour, Dayton, both in O., U.S.A.

435,039. **Composition of a Polyvinyl Acetal Formed from Polyvinyl Alcohol and an Aliphatic Aldehyde Which Contains a Stabilizer from the Group of Cyanamide and Dicyanamide.** Wingfoot Corp., Akron, assignee of F. W. Cox, Cuyahoga Falls, both in O., U.S.A.

435,040. **Curing Polyvinyl Butyral by Heating with Alkyl-Para Toluene Sulfonate Containing No More Than 5 Carbon Atoms in the Alkyl** Wingfoot Corp., assignee of LaV. E. Cheyney, both of Akron, O., U.S.A.

435,042. **Preparing a Water-Vapor-Resistant Surface on a Porous Paper by Coating First with a Polymer of at Least 75% of Vinyl Chloride, and Then with a Finish Coat of Vinyl Chloride-Vinylidene Chloride Copolymer Containing from 40 to 80% of Vinylidene Chloride.** Wingfoot Corp., assignee of LaV. E. Cheyney, both of Akron, O., U.S.A.

435,051. **Pentaerythritol.** C. Dreyfus, New York, N. Y., assignee of J. E. Bludworth, Cumberland, Md., both in the U.S.A.

435,085. **Preparing a Thermosetting Resin Curable without Further Addition of Catalyst by Condensing with an Aldehyde at a pH between 9.1 and 9.5 the Material Obtained by Heating Dicyanamide and a Phenol with Evolution of Ammonia.** American Cyanamid Co., New York, N. Y., assignee of F. J. Groten and J. H. Lower, both of Stamford, Conn., all in the U.S.A.

435,100. **Resinous Reaction Product of Aldehyde and Diazine Derivative.** Canadian General Electric Co., Ltd., Toronto, Ont., assignee of G. F. D'Alelio and J. W. Underwood, both of Pittsfield, Mass., U.S.A.

435,145. **Composition Particularly Adaptable for Use as Coating Material for Chemical Laboratory Furniture, Consisting of a Mixture of Furfural and Furfuralcohol, a Powdered Copolymer of Vinyl Chloride and Vinyl Acetate, and H_2SO_4.** Kewaunee Mfg. Co., Adrian, Mich., assignee of Institute of Paper Chemistry, assignee of H. F. Lewis, both of Appleton, Wis., all in the U.S.A.

435,242. **Making Olefin Oxides by the Direct Chemical Combination of Olefins with Molecular Oxygen in the Presence of a Surface Catalyst.** Carbide & Carbon Chemicals, Ltd., Toronto, Ont., assignee of G. H. Law, South Charleston, W. Va., U.S.A.

435,285. **Composition of Matter Including a Polymeride of a Vinyl Compound, Which Polymeride Is Incompatible with Cellulose Ethers or Esters, and an Unsaturated Ketone as Solvent therefor.** Shell Development Co., San Francisco, assignee of L. V. Steck, Piedmont, and F. A. Bent, Berkeley, all in Calif., U.S.A.

435,297. **In Producing Synthetic Rubber Articles, the Steps of Combining Substantial Amounts of Carbon Black and a Continuous Phase of Polymerizable Liquid, Deflocculating the Carbon Black in the Presence of an Anti-Agglomerating Agent, Agitating the Mixture after the Syrupy Stage Has Been Reached, Shaping the Polymerizable Material as Desired, and Completing Polymerization and Curing** T. A. TeGrotenhuis, Olmstead Falls, O., U.S.A.

United Kingdom

576,995. **Hardenable Composition Containing Urea-Aldehyde Resins.** American Cyanamid Co.

577,073. **Plastic Elastic Rubber-Like Substances.** Standard Oil Development Co.

577,137. **Resinous Polymerization Products.** British Thomson-Houston Co., Ltd.

577,182. **Shellac Modified Resins.** W. W. Triggs. (American Cyanamid Co.)

577,205. **Synthetic Linear Condensation Polymers.** Imperial Chemical Industries, Ltd.

577,256. **Moisture-Proofing Coating Compositions.** M. F. Monbiot.

577,277. **Glycols and Polyhydric Alcohols.** H. Dreyfus.

577,279. **Organic Sulfur Compounds.** E. I. du Pont de Nemours & Co., Inc.

577,288. **Resinous Polymerization Products.** British Thomson-Houston Co., Ltd.

577,317. **Styrene Polymers and Interpolymers.** R. G. R. Bacon, D. B. Kelly, and Imperial Chemical Industries, Ltd.

577,322. **Resinous Polymerization Products.** British Thomson-Houston Co., Ltd.

577,326. **Polymer Dispersions.** R. G. R. Bacon, H. Taylor, L. Wood, and Imperial Chemical Industries, Ltd.

577,350. **Polymerization of Olefinic Materials.** Standard Oil Development Co.

577,351. **Acid-Removal or Anion-Exchange Resins.** Permutit Co., Ltd., and E. L. Holmes.

577,384. **Terpene Resin.** S. G. Burroughs

577,428. **Semi-Conducting Materials.** Westinghouse Electric International Co.

577,432. **Bubble-Free Bodies from Synthetic Materials.** R. Staeger.

577,445. **Coating Compositions.** Anglo-Iranian Oil Co., Ltd., and E. S. Narracott.

577,472. **Preparation of Hydrogenated Rubber.** British Rubber Producers' Research Association, K. C. Roberts, and J. Wilson.

577,511. **Polymeric Materials.** Imperial Chemical Industries, Ltd.

577,561. **Phenol Formaldehyde Resins.** W. Charlton, J. B. Harrison, L. E. Perrins, and Imperial Chemical Industries, Ltd.

577,573. **Formaldehyde.** American Cyanamid Co.

577,626. **Solutions of Synthetic Linear Polyamides.** Imperial Chemical Industries, Ltd.

577,629. **Manufacture of Rubber.** Imperial Chemical Industries, Ltd.

577,632. **Purification of Alkyl Methacrylates.** E. I. du Pont de Nemours & Co., Inc.

MACHINERY

United States

2,399,422. **Device for Use in Conjunction with an Extruder for Cooling Fused Plastic Material.** F. G. Back, New York, N. Y.

2,399,560. **Reactor for Production of Olefins and Diolefins,** E. V. Murphree, Summit, N. J., assignor to Standard Oil Development Co., a corporation of Del.

2,399,937. **Tire Repairing Mold.** T. Norcross, Erdington, Birmingham, assignor to Dunlop Rubber Co., Ltd., London, both in England.

2,400,482. **Mold for Casting Resins.** J. L. Brannon, Plainfield, and S. A. Mraz, Perth Amboy, both in N. J., assignors to Bakelite Corp., a corporation of N. J.

United Kingdom

577,441. **Apparatus and Methods for Treating Yarn, Thread, or Cord.** United States Rubber Co.

577,474. **Apparatus for Heating Insulating Material by Subjecting It to a High Frequency Field of Electric Force.** British Insulated Cables, Ltd., J. C. Quayle, and P. Jones.

UNCLASSIFIED

United States

2,399,207. **Auxiliary Wheel and Tire Carrier.** K. C. Clark, Watsonville, Calif.

2,399,791. **Hose Coupling.** C. L. Conroy, Libertyville, Ill.

2,400,107. **Low Air Pressure Alarm for Pneumatic Tires.** C. L. Dyke, Orange City, Iowa.

2,400,274. **Spare Tire Carrier for Trucks, Etc.** O. F. Ullman, Ellsworth, Kan.

2,400,338. **Clamp for a Flexible Conduit Adapted for End Engagement with a Fixed Object and a Coupling Nut.** A. H. Cadman, Orange, assignor to Breeze Corp., Inc., Newark, both in N. J.

2,400,606. **Apparatus for Inserting a Fiber Sleeve in the End of an Expansible Plastic Tubing.** M. O. Searle, Beverly Hills, Calif.

2,400,629. **Applicator for U-Shaped Attaching Members of a V-Belt Fastener.** H. L. Coats, Wheaton, assignor to Flexible Steel Lacing Co., Chicago, both in Ill.

2,400,686. **Tool for Inserting a Nipple into a Flexible Hose.** R. G. Cox, assignor to Michigan Patents Corp., both of Jackson, Mich.

2,400,697. **Twisting Mechanism for Twisting Strands to Form a Ply Construction.** A. P. Lewis, Fairhaven, Mass., assignor to United States Rubber Co., New York, N. Y.

2,400,930. **Ring for Locking the Bead Portions of a Pneumatic Tire on a Rim.** F. Herzegh, Shaker Heights, O., assignor to B. F. Goodrich Co., New York, N. Y.

2,400,969. **Combined Air Valve and Water Adapter for Attachment to a Tire Tube.** K. V. Baker, Malaga, O.

2,401,028. **Mildewproofing Textile Material.** W. P. ter Horst, Pompton Plains, N. J., assignor to United States Rubber Co., New York.

2,401,118. **Tire Removing and Spreading Device.** C. A. Talley and W. E. Grisham, San Antonio, Tex.

Dominion of Canada

435,009. **Electric Cable Joint.** Phillips Electrical Works, Ltd., Brockville, Ont., assignee of D. T. Hollingsworth, London, England.

435,068. **Automobile Skid Chain.** I. B. Holtz, Weirton, W. Va., U.S.A.

435,096. **Terminal Connector for Electric Cables.** British Insulated Cables, Ltd., Prescot, assignee of R. Blackburn, St. Helens, and C. H. M. Thorpe, Huyton, all in Lancashire, England.

United Kingdom

576,975. **Hose Clamps.** National Lock Co.

577,095. **Wheels of Tractor Vehicles.** R. Howarth.

577,184. **Couplings for Pipes or Electric Cables.** I. L. Wiggins.

577,248. **Joints in Stranded Electric Conductors, the Interstices between the Wires Containing Fluid under Pressure.** Callender's Cable & Construction Co., Ltd., and D. T. Hollingsworth.

577,487. **Gravity Operated Apparatus for Reeling Hose-Pipes, Cables, and the Like.** I. C. Martonfalvy and Uni-Gun Lubricating Equipment, Ltd.

TRADE MARKS

United States

420,720. **Aquaflex.** Extruded thermoplastic flexible tubing. Irvington Varnish & Insulator Co., Irvington, N. J.

420,727. Representation of a man made out of a roll of adhesive tape. Adhesive masking tape and cloth tape for mending fabrics. International Plastic Corp., Morristown, N. J.

420,837. **Corbra.** Narrow elastic fabric. Corset & Brassiere Trade Centre, Inc., New York, N. Y.

420,847. **Clorafin.** Solid resin comprised of chlorinated paraffin. Hercules Powder Co., Wilmington, Del.

420,886. **Plyowax.** Emulsion wax-type product for waxing rubber. Diversey Corp., Chicago, Ill.

420,900. **Blindfolded.** Raincoats. M. W. Frommer, doing business as Wells Clothes, Philadelphia, Pa.

420,949. **Belden.** Wires and cables. Belden Mfg. Co., Chicago, Ill.

420,963. **Dust-Sealed.** Transmission belts. Gates Rubber Co., Denver, Colo.

420,990. **very.** Footwear. Town & Country Shoes, Sedalia, Mo.

420,995. **Paralac.** Rubber cement. Testworth Laboratories, Inc., Chicago, Ill.

420,996. **Paratol.** Rubber cement. Testworth Laboratories, Inc., Chicago, Ill.

421,000. Representation of a winged foot separating the word: **"Goodyear,"** and also the words: **"Farm Progress."** House organ publication. Goodyear Tire & Rubber Co., Akron, O.

421,002. **Tonsa.** Footwear. Tonsa, Sociedad Anonima Comercial E Industrial, Buenos Aires, Argentina.

421,030. **Foamex.** Floor mats and pads, pads for sound deadening body panels, seat and seat back cushions, and arm rests, comprising sponge rubber and rubber substitutes. Firestone Tire & Rubber Co., Akron, O.

421,074. Representation of an Indian, with the words: **"La Crosse."** Footwear. La Crosse Rubber Mills Co., La Crosse, Wis.

421,082. **Saddlepatch.** Tire repair patches. General Tire & Rubber Co., Akron, O.

421,144. **M-V-Bar.** Containers. Protective Coatings Corp., Belleville, N. J.

421,152. **J. T.** Girdles, pantie girdles, and corsets. Diana Corset Co., Inc., New York, N. Y.

421,153. **Flexhesive.** Elastic adhesive bandages. Scholl Mfg. Co., Inc., Chicago, Ill.

421,159. **Darex.** Polymeric materials for use as synthetic rubber, and for use as an ingredient in rubber compounds. Dewey & Almy Chemical Co., Cambridge, Mass.

421,177. **Bulls-Eye.** Brake and clutch lining. Bendix Aviation Corp., Troy, N. Y.

421,195. **Teleprene.** Wire. Whitney Blake Co., Hamden, Conn.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EUROPE

FRANCE

Statistics on French Rubber Industry

Recently published data give an idea of the present situation of the rubber industry in France, compared with what it was before the invasion of Poland. Statistics published in 1941 showed that the industry employed at the end of 1938 and the beginning of 1939 a total of 48,220 persons, of whom 37,750 were factory workers and 10,470 office personnel. According to the various trade associations, the distribution among the different branches of the industry was as follows:

	Factory Workers	Office Workers
Syndicat du Caoutchouc	27,000	6,000
National Tire Trade Board (repairmen, dealers, retreaders)	3,000	1,500
Small manufacturers and dealers	4,500	2,500
Manufacturers of toys and balloons	750	120
Waste trade	400	100
Reclaimers	300	50
Renault, Bata	1,800	200
	37,750	10,470

Official figures issued in 1946 give the total number of persons at present employed in the French rubber industry as 25,591, and the distribution is not shown by trades, but by categories of concerns classed according to the number of their employees.

Categories No. of Employes	No. of Firms	No. of Office and Factory Workers
1 to 10	67	234
11 to 50	96	2,387
51 to 100	21	1,520
101 to 250	30	4,671
251 to 500	4	1,450
501 to 1,000	3	2,428
1,000 and over	4	12,901
	225	25,591

The consumption of natural and synthetic rubber during the period November, 1945-January, 1946, compared in the case of natural rubber with the monthly average consumption in 1938, and in the case of synthetic rubber with the monthly averages for 1942 and 1943, is given below:

CONSUMPTION OF NATURAL RUBBER

	Monthly Average, 1938	Nov., 1945	Dec., 1945	Jan., 1946
Total imports, *tons*	5,360	382	474	828
United States imports	—	382	474	828
Consumption	5,160	461	492	730

IMPORTS OF SYNTHETIC RUBBER (BUNA AND GR-S)

Imports	Monthly Average, 1942	Monthly Average, 1943	Nov., 1945	Dec., 1945	Jan., 1946
Germany (Buna) *tons*	627	841	18	22	—
United States (GR-S)	—	—	170	3,186	1,770
Consumption, Buna	512	888	157	70	10
(GR-S)	—	—	1,839	1,947	2,935

The production of rubber goods for the period November, 1945 to January, 1946, inclusive, compared with the monthly average for 1943, was as follows:

	Monthly Average 1943	Nov. 1945	Dec., 1945	Jan., 1946
Reclaim, *tons*	—	824	1,024	1,250
Adhesives and solutions	—	63	72	—
Tires:				
Automobile casings	1,012	2,822	2,787	3,860
Bicycle casings	278	559	573	682
Automobile tubes	62	246	227	300
Cycle tubes	25	55	56	64
Others	118	345	259	324
Total Tires	1,495	4,027	3,902	5,230
Other Rubber Goods:				
Hose and piping	216	478	427	490
Belting	137	334	297	370
Footwear	180	265	259	345
Heels, soles	476	760	672	950
Surgical and sanitary	50	92	85	86
Sheets, slabs, and mechanical rubber	361	595	538	—
Ebonite	44	112	97	139

Materials for the Rubber Industry

At a meeting of the Technical Commission held on March 15, 1946, France's position with regard to sources of auxiliary materials for the rubber industry was discussed. It was revealed that France is able to provide considerable quantities of fillers for the rubber industry, although some kinds would have to be tested and graded before they could be marketed. Of talcs, only those of Luzenac in the Pyrenees are considered useful for the rubber industry.

There is no lack of Kaolin, both of the silicous and micaceous types; the whitest and best qualities are found in Central France. It seems that the output in 1946 will exceed that of 1938 so that not only would it be possible to cover most of France's domestic needs, with a margin for safety, but there might even be a surplus for export.

Supplies of clays are abundant (450,000 tons a year), and a comparatively small proportion only is used by the rubber industry. The clays vary considerably in different districts; those of the Provins basin have an average alumina content and could in some cases be used to replace carbon black; these clays are in fact now being investigated by the Société Goodrich. French supplies of ground fossil silica are adequate both as to quantity and quality. As to mineral wax, a few small deposits are found in the Haute-Vienne region.

Textile materials will largely have to be imported; long staple cottons of Morocco and the Niger territory have been noted, and ramie has been considered. The attention of the Technical Commission has been called to the fiber of Spanish broom for use in rubber manufactures. This non-rotting fiber is cultivated in the Landes and has already been used in the manufacture of bicycle tires, for which purpose, however, it does not appear to be very advantageous because not only is the price high, but the resistance to flexing is low. However the fiber is finding a use in conveyer belts for coal mines, and it is also being tested for the manufacture of fabrics that can be proofed and used in apparel.

Experiments have been in progress in reclaiming GR-S with the aid of Renacite. It has been found that Renacite No. 1 and No. 2 cause dermatosis; but No. 3 is claimed non-toxic.

A French mission has been sent to Germany to investigate the possibilities of the production of carbon black. The factory at Worms reportedly stopped operations in January, 1945; but there was little damage, and 35 laborers and an office staff of three or four persons would be enough to start this factory again. The potential monthly output is said to be 150 to 200 tons.

The Oppenau factory had to close down in 1944 when the railway was cut. Output would have been about 350 tons in the second quarter of the year. Neither buildings nor installations were damaged by the bombings, and if the factory could be started again, it could produce about 50 to 60 tons of No. 350 carbon black per month. The basic materials used here are Napthalene, anthracene products, or anthracene oils. The factory is said to have a well-equipped testing laboratory.

GREAT BRITAIN

Rubber Consumption and Stocks

The Board of Trade has issued figures of average weekly consumption and stocks of natural, synthetic, and waste and reclaimed rubbers during the first three months of the current year, and for comparison, similar figures for the months of March, 1944, and March 1945.

As the table below shows, the expected decrease has taken place in the consumption of synthetic rubber now that more natural rubber has become available.

WEEKLY AVERAGE CONSUMPTION—IN TONS

Natural Rubber:	Mar., 1944	Mar., 1945	Jan., 1946	Feb., 1946	Mar., 1946
Total disposals	1,070	730	1,000	2,140	2,500
Home consumption	1,070	580	750	1,180	1,480
Synthetic rubber	620	1,250	1,180	910	730
Reclaimed rubber	760	550	540	520	530
Waste rubber	1,010	600	690	770	890

All March figures are averages of five-week periods.

The March, 1944, figure for reclaim includes consumption of crumb rubber.

STOCKS AT END OF MONTH—IN TONS

	Mar., 1944	Mar., 1945	Jan., 1946	Feb., 1946	Mar., 1946
Natural rubber	56,800	40,700	48,400	41,900	49,000
Synthetic rubber	18,910	49,690	12,490	9,790	9,400
Waste rubber	126,600	122,200	148,100	147,100	144,300
Reclaimed rubber	8,690	7,270	3,490	3,700	3,850

The March, 1944, figures for reclaim include stocks of crumb rubber.

Restrictions Eased

One by one the wartime restrictions on the manufacture and sale of various types of rubber goods are being lifted. In the House of Commons it was recently revealed that last fall full-scale production of rubber hot water bottles had been resumed, when restrictions on the amount of rubber manufacturers might obtain and use for this purpose had been lifted. Present production for the home market, it was added, is at a rate well in excess of consumption before the war.

Restrictions have recently been withdrawn on the distribution of various types of priority sports goods controlled under the Sports Gear (Control of Manufacture & Supply) (No. 2) Order. The goods that manufacturers may now supply without the hitherto required certificates include bladders and cases for footballs, net-balls and volley balls; also water polo balls, medicine and punch balls, and rounder balls.

Under the Control of Rubber Tires (No. 9) Order, all rubber tires, except new car-sized tires were released from control as of June 1. Following the announcement of this change, it was brought out in the House of Commons that production of tires had increased greatly in recent months and would continue to increase as additional labor was absorbed and trained in factories. Larger supplies were already reaching both commercial and private users.

Dunlop Rubber Expanding

At the forty-seventh general meeting of Dunlop Rubber Co., Ltd., the chairman, Sir J. George Beharrell, stated that despite various difficulties, the company is in a far stronger position than ever before to maintain supplies of tires to customers. There are now three factories within the company in the United Kingdom to draw on for tires: Fort Dunlop, the main tire factory, now almost entirely devoted to this branch of manufacture; the development at Speke; and the Scottish subsidiary; so that tire consumers are insured against the ill effects of any local emergency.

The outlook for Dunlopillo is pronounced good, and the factories producing general rubber goods are working to capacity. The rubber footwear section is being returned to

normal conditions, and it is expected this section will become increasingly important.

The overseas companies, in France, the United States, Canada, Ireland, Australia, India and South Africa, all reported good, some even very good, progress in 1945, and provision for a plant in New Zealand is going ahead.

Conversion to peace-time production, however, is not proceeding so rapidly as desired, owing to the shortage of labor. On the other hand the relation of the concern and its employes continues satisfactory. The management is making preparations for the reception of demobilized employes, and a special training center has been established at Fort Dunlop; in addition the company has embarked on a program of improving training arrangements in general.

Considerable extension of research and new development work is planned in order to take advantage of the rapid advances in science and technology, and a large modern building is being acquired as a research and development center.

The new plans for expansion will require additional capital; the company has therefore issued £6,000,000 of 3½% debenture stock, part of the proceeds of which will be used for expansion at home and abroad, and part to satisfy holders of the existing 4% debentures redeemable January 1, 1947. Holders of the 4% stock may convert to the new stock.

The full accounts of the company show a trading profit, interest, dividends on investments (including those of subsidiary and associated companies) of £3,487,297 for 1945, against £3,219,289 for 1944. The former amount is increased to £3,926,657 by the addition of various sums set aside during the war and now no longer required for the intended purposes. After deduction of amounts for depreciation, directors' and audit fees, guaranteed preference of Dunlop Plantations, and interest on debenture stock, the net profit was £3,117,850 against £2,615,700 in 1944. After provisions for dividends on ordinary shares (10% plus 2% bonus in 1945 against 8% in 1944), excess profits tax, income tax, contingencies reserves, and preference dividends, the sum of £783,331 was left to be carried forward, as compared with £648,091 in the preceding year.

SWITZERLAND

Status of Swiss Rubber Industry

Information regarding the activities of the Swiss rubber industry during the war is beginning to come in, but no statistics seem to have been released yet.

Revue Générale du Caoutchouc[1] reveals that during the war the Swiss rubber industry was attached to a War Industry and Labor Office which, through its Rubber Division, distributed raw materials, controlled undertakings, and directed

[1] May, 1946, p. 117.

and encouraged industry, especially in its efforts to adapt itself to the conditions brought about by the scarcity of rubber.

The war found Switzerland with rubber supplies barely sufficient for six months' normal consumption; then arrivals of rubber became less and less frequent and ceased altogether by the Spring of 1941. Supplies of synthetic rubber could not be bought either. To relieve the situation all possible measures were taken: experiments in growing *Kok-saghyz* were started; "Thiokol" and polyvinyl chloride were used as well as relatively large amounts of reclaim. Small amounts of "Thiokol" were produced in the rubber factory at Altdorf and in a chemical factory at Altstetten, but it is not expected that much of this material will continue to be used once the situation with regard to supplies of rubber becomes normal again.

Vinyl chloride, produced and marketed under the name "Plastosin," by the Lonza concern, which has offices at Basle and a factory at Viège, has been perfected so that it is now successfully used for shoe soles, for which purpose it seems to be particularly well suited.

The main stand-by of the rubber industry was—and apparently still is—reclaimed rubber which was produced by two firms, the Altdorf concern (Schweizerische Draht & Gummiwerke) which treats waste with ammonia, and the Société Industrielle du Caoutchouc, Fleurier, which uses the steam method. The Huber concern at Pfaffikon, Maurer at Gelterkinden, and Bata at Mohlin also produce reclaim, but for their own use only.

As the rubber industry was forced to use more and more reclaim, new processes had to be developed and in some cases machines had to be modified. The use of reclaim also brought with it other difficulties, and to top everything, prices rose steeply; cycle tires which could be had for 2.50 francs (Swiss currency) before the war, now brought 15 francs. This still seems to be the price for cycle tires in Switzerland. The best qualities of reclaim were naturally used for the production of tires; cycle and tractor tires were made wholly of reclaim, and automobile tires contained only 10% natural rubber. The reclaim tires were satisfactory enough under the circumstances; in tests, cycle tires gave mileages of some 7,000 kilometers, while the automobile tires with 10% natural rubber had a life of over 10,000 kilometers; individual tires are said to have run for as much as 20,000 kilometers. The shortage of inner tubes was even more acute than that of tires since the former could not be made of the reclaim.

The total amount of reclaim used in Switzerland during the war is said to have been 800 to 1,000 tons a year.

Since the end of the war small amounts of rubber have been received. In the Spring of 1945, 500 tons (125 tons natural and 375 tons synthetic rubber) were allocated to Switzerland, but by the end of the year only about 200 tons had been received, whereas prewar consumption had been 2,500 tons a year.

Switzerland is one of the few European countries to come out of the war with her factories and equipment intact, which under present conditions gives her an advantage she is anxious to make use of. However to do so she must have adequate supplies of raw materials and necessary chemicals; she will probably also have to replace at least a part of her machinery by newer models if she wishes to increase her productivity. The table below gives the important Swiss rubber manufacturing concerns and the principal products that they make.

Leading Swiss Rubber Manufacturers and Products Thereof

Companies	Reclaim	Auto Tires	Cycle Tires	Technical Goods	Sanitary Goods	Proofed Fabrics and Thread	Footwear
Firestone A. G., Pratteln		X					
Schweizerische Draht & Gummiwerke, Altdorf	X		X	X			
Schweizerische Kabelwerke Huber, A. G., Pfaffikon	X	X	X	X			
Lonstorff Schweizerische Gummiwarenfabrik, A. G., Aarau				X	X		
Suhner & Co., Gummiwerke, Herisau				X			
Gummiwerke, Richterswil					X	X	
Pneufabrik F. Maurer, Gelterkinden	X		X	X			
Bally, Schonenwerd						X	X
Bata, Mohlin	X						X
Gummifabrik Grenchen, Grenchen	X		X	X			
Cableries de Cossonay, Cossonay				X		X	
Stamm & Co., Eglisau						X	
Laboratoires Tantu, Geneva						X	
Lamprecht & Co., Oerlikon					X		
Societe Industriéllé, Fleurier	X			X			
Rubber Co., Rosi				X			

Editor's Book Table

BOOK REVIEWS

"Advances in Colloid Science. Volume II — Scientific Progress in the Field of Rubber and Synthetic Elastomers." Edited by H. Mark and G. S. Whitby. Interscience Publishers, Inc., 215 Fourth Ave., New York 3, N. Y. Cloth 6 by 9 inches, 492 pages. Price $7.

The plan for this second volume was made by the late Elmer O. Kraemer who felt that the quantity and importance of recent work in the field of natural and synthetic rubbers justified devoting an entire volume to it. In addition to serving as an up-to-date presentation of fact and theory, the book is intended to act as an inspiration to the further development of the scientific knowledge of elastic polymers.

Following a biography of Dr. Kraemer, prepared by J. Burton Nichols and Edward B. Sanigar, is a very thought-provoking introduction by G. S. Whitby, in which he emphasizes the need of continued and persistent research to secure an adequate understanding of the peculiarities of behavior of synthetic rubbers and to develop basically improved general-purpose synthetic rubbers.

The first of the nine regular chapters of this volume is on "Second-Order Transition Effects in Rubber and Other High Polymers," by R. F. Boyer and R. S. Spencer, in which these authors survey in part what has been found experimentally in regard to second-order transitions in rubber and like materials and endeavor to interpret the results on the basis of the theory of a critical amount of rotation about carbon-carbon bonds at the transition temperature. The chapter on "Crystallization Phenomena in Rubbers," by L. A. Wood, includes some results of several investigations at the National Bureau of Standards which, because of the pressure of war work, have remained unpublished up to the present time. A very comprehensive discussion of X-ray diffraction methods, including a survey of methods and limitations, is found in "The Study of Rubber-Like Substances by X-Ray Diffraction Methods," by C. W. Bunn.

"Thermodynamics of Rubber Solutions and Gels" is reviewed by G. Gee. This author emphasizes the need of much more work in this field. The "Significance of Viscosity Measurements on Dilute Solutions of High Polymers" is dealt with in considerable detail by R. H. Ewart. It is pointed out that the relation between solution viscosity and molecular weight is at present by no means a settled question and that the results as expressed by the various workers in this field may be divided into two general classes: (1) linear and (2) non-linear relation between reduced viscosity and molecular weight. "The Kinetic Theory of Rubber Elasticity" is treated by E. Guth, H. M. James, and H. Mark. "Vulcanization" is discussed by E. Harold Farmer, and "Rubber Photogels and Photovulcanizates" by Henry P. Stevens. The most important matter of "Reinforcing and Other

Properties of Compounding Ingredients" is reviewed in the last chapter by Donald Parkinson.

There are extensive bibliographies given in each chapter and, in addition, an appendix listing further recent literature references, and extensive author and subject indices.

This volume is a valuable addition to the present-day literature in the field of rubber and synthetic elastomers and should be a welcome source of information to other workers on the more recent scientific progress that has been made in these fields.

"1945 Supplement to A.S.T.M. Standards Including Tentatives. Part III. Non-Metallic Materials—General." American Society for Testing Materials, 260 S. Broad St., Philadelphia 2, Pa. Cloth, 6 by 9 inches. 518 pages. Price: members, $2.50; non-members, $4.

The Supplement contains the new and revised standards and tentatives in the non-metallic general materials field that have been accepted since the appearance of the "1944 Book of Standards, Part III." Of the 24 standards 11 are newly adopted, and 13 are replacements of existing standards. Similarly, 27 of the 70 tentatives are replacements; while the remaining 43 are published for the first time. The format is the same as that of previous issues, and there are subject and numerical indices.

For rubber are four standards: one for accelerated aging of vulcanized rubber by the oven method, and three tentative standards on natural rubber caps for use in hydraulic actuating cylinders, identification and quantitative analysis of synthetic elastomers, and conditioning of rubber and plastic materials for low-temperature testing. Included also are 13 specifications and standards for plastics, and seven specifications and methods of testing plastics used as electrical insulating materials.

"Catalytic Chemistry." Henry William Lohse. Chemical Publishing Co., Inc., 26 Court St., Brooklyn 2, N. Y. Cloth, 5½ by 8½ inches. 482 pages. Price $8.50.

This book aims at a factual presentation of the underlying principles of catalytic phenomena and the application of catalytic reactions in industrial processes. In many cases no attempt has been made to modify the original author's view, although such a presentation may lack cohesion. This policy was followed in order to reflect the multiplicity of experience and variance in conceptions which exist in catalytic chemistry up to this time. Particular attention has been paid to the presence of impurities in catalytic reaction systems and to the role of traces of other metals in silver, copper, iron, nickel, etc., used as catalysts, a phase of the work to which the author believes not enough attention has been given. Indexed both by author and subject and containing adequate references, the book will be of general interest to chemists and chemical engineers in many industries as a source of information on a rather little understood subject.

There are five chapters, with a brief history of catalytic chemistry given in Chapter I. Chapter II deals with catalytic theory; Chapter III with the nature and properties of catalysts; and Chapter IV with specific types of catalytic reactions. Industrial catalytic reactions are discussed in the final chapter. Of particular interest are the sections dealing generally with catalysis of polymerization and condensation reactions, and the individual sections on the catalytic preparation of butadiene, various rubber compounding ingredients such as fatty acids, higher alcohols, etc., and synthetic rubbers including isoprene, chloroprene, Buna S and N, and others.

NEW PUBLICATIONS

"Pepton 22." American Cyanamid & Chemical Corp., 30 Rockefeller Plaza, New York, N. Y. 54 pages. The chemical and physical properties of Pepton 22, a non-staining peptizer for GR-S and natural rubber, are described herein. There are two main sections covering the use of this material in GR-S and natural rubber, with subsections on compounding characteristics, method of use, effects in mixing and milling, and effect on various types of formulations. Many tables and graphs of test data are given to show the increase in plasticity obtained with this new material during hot or cold Banbury or mill breakdown.

"**Witco Stearates** — Aluminum, Barium, Calcium, Lead, Magnesium, Sodium, Zinc." Bulletin 46-1. May, 1946. Witco Chemical Co., 295 Madison Ave., New York, N. Y. 24 pages. This bulletin reviews the use of stearates in various applications, including rubber, plastics, paints, inks, oils and greases, and cosmetics. Data sheets on the properties of the company's stearates are given together with charts and illustrations of the effect of the materials in various products.

"**Equipment News.**" Bulletin No. 21-R-462. Farrel-Birmingham Co., Inc., Ansonia, Conn. 4 pages. This bulletin gives information and illustrations of new and available equipment, including a new small-size Banbury mixer for rubber and plastics; a two-roll, inclined laboratory calender for process-testing linoleum; a line of heavy-duty milling equipment; a heavy-duty cracker especially designed for old tire carcasses; and the Hale pelletizer for producing pellet rubber.

"**GR-A Compounding.**" Compounding Research Report No. 1. Naugatuck Chemical Division of United States Rubber Co., New York, N. Y. 4 pages. Charts and tables are given to show the effect of varying quantities of Monex accelerator and Sunproof on the physical properties of standard GR-A vulcanizates. Monex and Sunproof are shown to give excellent results in such compounds.

"**Barrett Rubber Compounding Materials.**" Rubber Laboratory Release No. 2. June 20, 1946. The Barrett Division, Allied Chemical & Dye Corp., 40 Rector St., New York 6, N. Y. 32 pages. This bulletin gives data on tensile, compression set, tear resistance, resilience, hysteresis, crack-growth resistance, and abrasion properties obtained by the use of Carbonex, Carbonex S, and Carbonex S Plastic softeners in GR-S; the substitution of Carbonex for limited amounts of EPC black in GR-S tread type recipe; and the use of DX, EX, and FX grades of Cumar in an EPC black GR-S formulation.

"**Plastics Primer.**" Dow Chemical Co., Midland, Mich. 20 pages. This is a non-technical review of the plastics field, covering materials and their origin and methods of molding. Individual sections review the company's plastics, Styron, Ethocel, Saran, and packaging materials, their history and application. There is also a section on plastics at work which includes many illustrations of applications in various fields.

"**Great Grow the Gases.**" June, 1946. American Petroleum Institute, New York, N. Y. 20 pages. This profusely illustrated brochure recounts the history of the origin and growth of the natural gas industry. The use of natural gas in industry is discussed, including the manufacture of carbon black for rubber, and its role in the preparation of many plastics.

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Dominion of Canada Statistics

Imports of Crude and Manufactured Rubber

	May, 1946		May, 1945	
UNMANUFACTURED	Quantity	Value	Quantity	Value
Balata ... *lbs.*	5,679	$ 4,171	......	......
Crude rubber ... *lbs.*	1,451,225	238,777	910,299	$ 365,907
Gutta percha ... *lbs.*	1,000	2,939	......	......
Latex ... *lbs.*	121,267	62,989	......	......
Rubber, powdered, and waste ... *lbs.*	573,700	11,050	690,600	25,179
Recovered ... *lbs.*	2,567,100	200,047	1,972,700	136,701
Synthetic and substitute. *lbs.*	565,200	158,138	660,100	208,751
TOTALS..	5,285,171	$ 678,111	4,233,699	$ 736,538
PARTLY MANUFACTURED				
Hard rubber in rods or tubes. *lbs.*	1,106	$ 859	1,172	$ 668
Rubber thread, not covered. *lbs.*	5,773	8,521	5,715	9,921
TOTALS..	6,879	$ 9,380	6,887	$ 10,589
MANUFACTURED				
Belting ...	......	$ 54,241	......	$ 30,559
Boots and shoes of rubber, n.o.p ... *prs.*	4,052	3,893	20,302	22,223
Canvas, shoes with rubber soles ... *prs.*	72	165	......	......
Cement ...	......	38,356	......	21,754
Clothing of waterproofed cotton or rubber ...	......	939	......	1,307
Druggists' sundries ...	......	37,454	......	32,187
Gaskets and washers...	......	15,312	......	12,490
Gloves ... *doz. prs.*	565	2,592	409	2,191
Golf balls ... *doz.*	49	188	......	......
Heels ... *prs.*	3,661	402	......	......
Hose ...	......	26,011	......	46,886
Hot water bottles...	......	1,224	......	89
Inner tubes, n.o.p... *no.*	173	3,020	52	253
Bicycle ... *no.*	1,300	942	928	529
Liquid sealing compound...	......	9,176	......	11,052
Mats and matting...	......	20,322	......	10,465
Nursing nipples ... *gross*	794	2,884	740	1,957
Packing, rubber ...	......	11,191	......	14,259
Tire repair material...	......	6,147	......	12,819
Tires, pneumatic, bicycle... *no.*	1,508	2,004	1,932	2,109
Vehicle, n.o.p. ... *no.*	585	36,049	108	5,856
Solid for automobile and motor trucks ... *no.*	23	1,488	48	884
Other ...	......	2,405	......	1,629
Other rubber manufactures...	......	249,305	......	233,514
TOTALS..	......	$ 525,710	......	$ 465,012
TOTALS, RUBBER IMPORTS.	......	$1,213,201	......	$1,212,139

Exports of Crude and Manufactured Rubber

UNMANUFACTURED				
Crude rubber, including synthetic rubber... *lbs.*	1,840,929	$ 372,529	2,957,849	$1,121,765
Waste rubber ... *lbs.*	1,613,800	28,140	2,504,500	36,260
TOTALS..	3,454,729	$ 400,669	5,462,349	$1,158,025
PARTLY MANUFACTURED				
Soling slabs of rubber... *lbs.*	23,540	$ 6,956	22,410	$ 4,634
MANUFACTURED				
Belting, n.o.p. ... *lbs.*	253,168	$ 155,641	87,345	$ 54,666
Belts, fan ...	......	5,344	......	......
Boots and shoes of rubber, n.o.p. ... *prs.*	290,005	433,689	168,839	314,939
Canvas shoes with rubber soles ... *prs.*	116,373	110,400	38,804	32,808
Clothing of rubber and waterproofed clothing ...	......	79,693	......	30,684
Heels ... *prs.*	194,995	18,621	282,509	46,164
Hose ...	......	54,738	......	59,372
Inner tubes for motor vehicles ... *no.*	60,984	124,123	25,215	102,701
Soles ... *prs.*	13,689	3,418	13,132	1,563
Tires, pneumatic for motor vehicles ... *no.*	43,411	920,683	25,588	1,088,503
Other ... *no.*	6,575	5,659	459	13,473
Wire and cable, insulated...	......	171,929	......	240,937
Other rubber manufacturers..	......	66,328	......	220,746
TOTALS..	......	$2,150,266	......	$2,206,556
TOTALS, RUBBER EXPORTS.	......	$2,557,891	......	$3,369,215

Market Reviews

COTTON & FABRICS

New York Cotton Exchange Week-End Closing Prices

Futures	May 25	June 29	July 6	July 13	July 20	July 27
Aug. .	27.97	31.05	31.08	34.09	35.88	32.46
Oct. ..	28.15	31.10	31.11	34.23	35.80	32.38
1947						
Jan. ..	28.28	31.24	31.30	34.39	35.87	32.41
Mar. .	28.48	31.10	31.32	34.38	35.90	31.98
May .	28.51	31.05	31.29	34.17	35.50	31.68
July .	28.44	30.92	31.08	33.75	34.85	31.04

COTTON futures prices hit the 100-point ceiling four times during July, in the most bullish market since 1924.

The 15/16-inch spot middling price recorded on July 1 was 32.15¢ a pound; prices then dropped to 31.73¢ July 5, the low for the month. However on July 8, prices started on an upward spiral and reached 35.84¢ on July 15. The market then lost 57 points until July 19, when prices began another ascent, climbing to 36.61¢, on July 22. At this peak prices broke and fell to 32.48¢ a pound on July 30, but on the following day the July market closed at 34.53¢ a pound.

The price recorded on July 1 for September futures was 31.54¢ a pound; it dropped to the low of the month of 31.09¢ on July 5, but on the next trading day, July 8, prices rose 100 points and continued upward until July 15, when the market registered 35.16¢ a pound. Prices then dropped off until July 18, but on the following day started rocketing upward and scored another 100-point gain, and reached 35.48¢ a pound on July 22. Prices then declined the 100-point limit for three consecutive days, continuing to fall until July 30, when the price recorded was 31.78¢. Then with the trading limit raised to a 200-point limit the market closed on July 31 at 33.78¢ a pound.

Principal factor in the strength of the market last month was the unexpectedly small acreage estimate issued by the Crop Reporting Board of the Department of Agriculture. While private trade estimates had indicated a planted cotton acreage of anywhere from 19,000,000 to 19,800,000 acres, the official government report showed an estimated acreage as of July 1 of only 18,316,000 acres. With domestic carryover of all cottons at the end of the current season of approximately 7,500,000 bales, and with indications of production for the new crop running in the neighborhood of 10,000,000 bales, a total supply for next season of around 17,500,000 bales appears in prospect. This compares with the supply for the current season of 20,400,000 bales and for last season, 22,789,000 bales.

This fact coupled with the present high consumption rate (current predictions in trade quarters are for a consumption next season of about 10,000,000 bales), and the favorable export outlook indicated by the credit agreement signed by the United States and Czechoslovakia for $20,000,000, to be used by Czech textile mills to buy raw American cotton, and the $3,750,000,000 loan to Britain, indicate an extremely tight supply situation for the coming season.

Another and highly influencing factor in the market last month was the demise of the OPA as of June 30. With free markets reestablished, and the supply and demand factor now being a major influence, traders asserted that cotton futures are finding their proper levels.

However confusion followed the adoption of a compromise price control measure by the House-Senate conference committee. This nervousness resulted not from the fact that any pricing agency would attempt to put ceilings on the current crop or restore higher margins, but from the fact that the market has been adjusting itself to the prospect that ceilings on cotton goods would not be restored. With an advance from 10 to 20% in textile prices since June 30, it is feared that these goods may be subject to a roll back with the revival of OPA, and this action will undoubtedly influence the amount of forward buying into which mills might wish to enter.

Fabrics

With the death and rebirth of the OPA, trading in the fabrics market was almost completely withdrawn.

After the dissolution of the OPA some lots of goods moved, generally at a 20% increase, but few mills entered into contracts fearing that if the OPA were reinstated, ceilings would be reimposed at about former levels while increases were being officially worked out.

Another factor halting the sale of textiles was the bullish movement in the raw cotton market. Several commission houses had decided to take a chance on the reenactment of the Price Control Bill, and would have proceeded on the theory that with or without a free market prices would remain fairly stable. But with the sudden rise of the raw material, which in staple gray goods accounts for at least 50% of the cost, the necessity for caution became apparent.

The new M-317A and SO M-317A, as amended July 11, now allow that chafer fabrics be certified for industrial and agricultural purposes only when ordered for ultimate use in the manufacture of tires and mechanical rubber goods. Another important change in the order is that exceptions for "use in the gray" set asides are now all listed specifically in the order. Hospital sheeting and supplies, surgical tape and bandages, and dressings are included. Formerly these exceptions were granted by appeals. It also provides that "manufacturers of coated fabrics may certify that the fabrics which they order for coating will be used in the gray only if the fabrics are to be coated without being bleached, dyed, printed, or otherwise finished (except starching, napping or combining.)"

With the present high cost of cotton staple forcing the price of cotton tire cord upward to about 62¢ a pound, the substitution of rayon cord for cotton cord looms. Rayon cord of the 1100 denier two-ply variety is currently selling at 57¢ a pound.

The reinstatement of the OPA saw the market remain frozen pending the settlement of the price question. However on July 30, an industry and OPA agreement was reached, but it remains to be seen whether this agreement will stimulate selling. The cotton textile representatives and OPA officials agreed on an increase for cotton textile averaging 16% above ceilings in effect before June 30. It was agreed to use the average market price from June 23 to July 22 on raw cotton in figuring new prices for textiles.

Fixed Government Prices*

	Price per Pound: Civilian Use	Price per Pound: Other Than Civilian Use
Guayule		
Guayule (*carload lots*)	$0.17½	$0.31
Latex		
Normal (*tank car lots*)	.26	.43½
Creamed (*tank car lots*)	.26¾	.44¼
Centrifuged (*tank car lots*)	.27¾	.45¼
Heat-Concentrated (*carload drums*)	.29½	.47
Plantation Grades		
No. 1X Ribbed Smoked Sheets.	.22½	.40
1X Thin Pale Latex Crepe...	.22½	.40
2 Thick Pale Latex Crepe....	.22	.39½
1X Brown Crepe	.21⅜	.38⅞
2X Brown Crepe	.21⅛	.38⅝
2 Remilled Blankets (Amber)	.21¼	.38¾
3 Remilled Blankets (Amber)	.21⅛	.38⅝
Rolled Brown	.18	.35½
Synthetic Rubber		
GR-M (Neoprene GN)	.27½	.45
GR-S (Buna S)	.18½	.36
GR-I (Butyl)	.18½	.33
Wild Rubber		
Upriver Coarse (crude)	.12⅝	.26⅛
(washed and dried)	.20¼	.37¾
Islands Fine (crude)	.14⅝	.28¼
(washed and dried)	.22½	.40
Caucho Ball (crude)	.11⅝	.24¾
(washed and dried)	.19½	.37
Mangabiera (crude)	.08½	.19¾
(washed and dried)	.18	.35½

* For a complete list of all grades of all rubbers see Rubber Reserve Co. Circular 17, p. 169, May, 1943, issue.

SCRAP RUBBER

THE extreme dullness which characterized the scrap rubber market for the past few months continued during July, as both consumers and dealers adopted a watchful attitude with respect to latest price control developments. Very few transactions took place as shippers pointed out that freight rates in the so-called "official territory" on the Eastern seaboard north of Virginia were 5% higher than in the rest of the nation.

While the domestic situation remained quiet and unchanged, it was reported that prospects for scrap rubber exports have shown decided improvement. According to trade reports and Bureau of the Census statistics, shipments abroad have doubled since the first month after V-J day. In fact shipments have steadily increased, reaching more than 2,000,000 pounds during March, 1946. Latin America represents an important source of export consumer demand, with reclaimers in Argentina and some of the other South American countries on the market for tires and tubes. Here again the specifications call for synthetic-free material, bringing exporters up against the problem that has been the bane of the domestic market for some time. Reports in the trade indicate that tires for export have moved at the $18.50 per ton f.a.s. price which would be the former OPA ceiling price.

Following are dealers' buying prices for scrap rubber in carload lots, delivered at points indicated:

	Eastern Points	Akron, O.
	(Net Tons)	
Mixed auto tires	$17.50	$18.00
Truck and bus tires	17.50	17.00
Beadless tires	23.00	24.00
S.A.G. passenger (natural)	17.50	18.00
S.A.G. passenger (synthetic)	nom.	nom.
S.A.G. truck (natural)	15.50	nom.
S.A.G. truck (synthetic)	nom.	nom.
No. 1 peelings (natural)	44.00	nom.
No. 1 peelings (synthetic)	nom.	nom.
No. 1 peelings (recap.)	37.00	nom.
No. 2 peelings (natural)	30.00	30.00
No. 2 peelings (synthetic)	nom.	nom.
No. 2 peelings (recap.)	23.00	nom.
No. 3 peelings (natural)	28.00	28.50
No. 3 peelings (synthetic)	nom.	nom.
	(¢ per Lb.)	
Mixed auto tubes	5.5	5.25
Red passenger tubes	7.25	7.25
Black passenger tubes	6.25	6.25
Black truck tubes	6.0	6.125
Mixed puncture-proof tubes	2.0	2.0
Air brake hose	nom.	nom.
Rubber boots and shoes	nom.	nom.

Rims Approved and Branded by The Tire & Rim Association, Inc.

Rim Size	June, 1946
15" & 16" D. C. Passenger	
15x4.00E	4,908
16x4.00E	342,608
16x4.25E	3,629
16x4.50E	247,473
15x5.00E	59,078
16x5.00F	27,329
15x5.50F	28,260
16x5.50F	9,510
16x4.00E—Hump	171,990
15x4.50E—Hump	37,073
15x5.50F—Hump	651
15x5—K	32,175
16x5—K	24,403
16x6—L	31,934
17" & Over Passenger	
18x2.15B	990
18x6-L	4,216
Flat Base Truck	
17x3.75P	500
20x3.75P	3,124
17x4.33R	8,140
20x4.33R	26,830
15x5.00S	1,052
17x5.0	13,341
18x5.00S	153
20x5.00S	242,335
24x5.00S	239
15x6.00T	2,081
20x6.0	375
20x6.00T	39,599
20x7.33V	43,119
22x7.33V	14,555
24x7.33V	2,368
19x8.37V	82
20x8.37V	662
24x8.37V	1,488
20x10.0	223
20x10.00W	296
24x10.00W	1,513
Semi D. C. Truck	
16x4.50E	3,755
15x5.50F	3,264
Tractor & Implement	
12x2.50C	21,076
12x3.00D	6,343
15x3.00D	30,917
16x3.00D	9,176
18x3.00D	1,193
21x3.00D	1,129
36x3.00D	815
18x5.50F	20,396
20x5.50F	16,019
24x5.50R	1,346
36x6.00S	667
40x6.00S	463
24x8.00T	3,876
28x8.00T	3,055
32x8.00T	808
36x8.00T	2,295
W8-24	18,720
W8-36	1,055
W9-38	2,648
W10-24	2,331
W10-28	2,029
W10-36	6,579
W10-40	8[illegible]0
DW8-38	126
DW9-38	2,133
DW10-38	6,763
Earth Mover	
24x15.00	309
Total	1,598,468

RECLAIMED RUBBER

MARKET conditions for reclaimed rubber remained the same during the past month. The industry continued working at top speed with orders still in excess of production and shipments lagging behind schedules. Despite the lapse of price control, quotations remained in accordance with previous ceilings while reclaimers awaited further OPA developments.

The Rubber Division of CPA released statistics on the new supply, distribution, and end-of-year stocks of rubber, including reclaims, for the years 1939 through 1945. Reclaim statistics include only natural rubber reclaim from 1939 to 1943, and both natural and synthetic reclaims in 1944 and 1945. The figures given below are in long tons.

Reclaimed Rubber Prices

Auto Tire	Sp. Grav.	¢ per Lb.
Black Select	1.16-1.18	7½ / 7¾
Acid	1.18-1.22	8½ / 8¾
Shoe		
Standard	1.56-1.60	8 / 8¾
Tubes		
Black	1.19-1.28	12¼/12½
Gray	1.15-1.26	13 /14
Red	1.15-1.32	13 /13½
Miscellaneous		
Mechanical blends	1.25-1.50	5½/ 6½

The above list includes those items or classes only that determine the price basis of all derivative reclaim grades. Every manufacturer produces a variety of special reclaims in each general group separately featuring characteristic properties of quality, workability, and gravity at special prices.

	New Supply		Distribution		
Year	Domestic Production	Total Imports	Domestic Consumption	Total Exports	End-of-Year Stocks
1939	186,000	8	170,000	12,610	25,250
1940	208,971	Under 0.5	190,244	11,343	32,630
1941	274,202	—	251,231	13,851	41,750
1942	285,114	893	254,820	30,405	42,532
1943	303,991	67	291,082	15,678	46,201
1944	260,607	24	251,085	11,800	43,832
1945	243,309	Under 0.5	241,036	13,413	28,155

Dividends Declared

Company	Stock	Rate	Payable	Stock of Record
Anaconda Wire & Cable Co.	Com.	$0.25	July 22	July 12
Baldwin Rubber Co.	Com.	0.17½	July 22	July 15
Belden Mfg. Co.	Com.	0.30 q.	Sept. 1	Aug. 17
Dayton Rubber Mfg. Co.	Com.	0.20	July 25	July 10
Dayton Rubber Mfg. Co.	"A"	0.50 q.	July 25	July 10
Detroit Gasket & Mfg. Co.	Com.	0.25	July 25	July 10
De Vilbiss Co.	(New)	0.25 init. q.	July 20	July 10
Dunlop Rubber, Ltd.	(ADR)	0.25 3/5 interim	July 10	May 24
Electric Hose & Rubber Co.	Com.	5.00 irreg.	Aug. 21	Aug. 14
Firestone Tire & Rubber Co.	Pfd.	1.12½ q.	Sept. 1	Aug. 15
Goodyear Tire & Rubber Co., Inc.	Com.	0.75	Sept. 16	Aug. 15
Goodyear Tire & Rubber Co., Inc.	Pfd.	1.25 q.	Sept. 16	Aug. 15
Gro-Cord Rubber Co.	Com.	0.10 q.	June 28	June 18
Lee Tire & Rubber Co.	Com.	0.50 q.	Aug. 1	July 15
Midwest Rubber Reclaiming Co.	Com.	0.25 init. q.	Aug. 1	July 18
O'Sullivan Rubber Co., Inc.	Com.	0.10 q.	July 1	June 15
O'Sullivan Rubber Co., Inc.	Pfd.	1.25 q.	July 1	June 15
Thermoid Co.	Pfd.	0.[illegible]½ q.	Aug. 1	July 26
United States Rubber Co.	8% Non-Cum. 1st Pfd.	2.00	Sept. 9	Aug. 19
United States Rubber Co.	Com.	1.00 incr.	Sept. 9	Aug. 19

Financial

(Continued from page 702)

Hercules Powder Co., Wilmington, Del. First six months: net earnings, $3,629,885, equal, after preferred dividends, to $1.30 each on 2,633,420 common shares outstanding, contrasted with $2,898,767, or $1 a share, in the like period of 1945; net sales, $47,050,408, against $56,590,752.

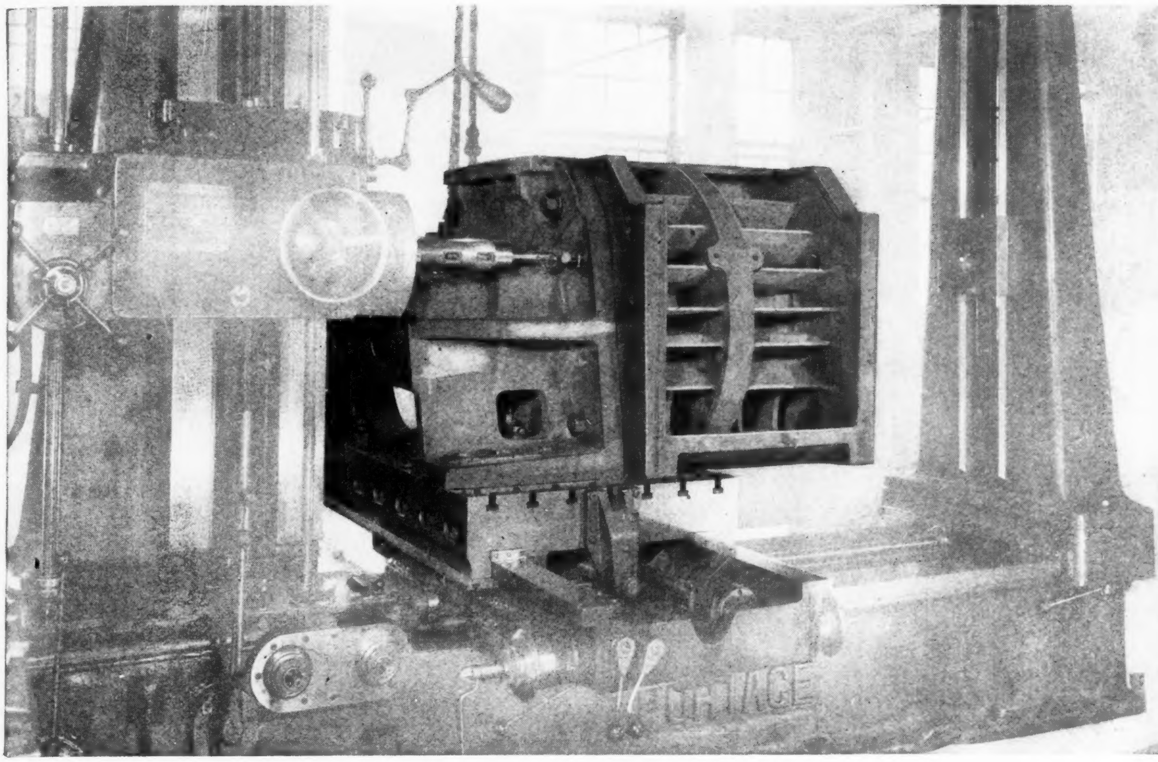
Industrial Rayon Corp., Cleveland, O. First half, 1946: net earnings $4,346,311, equivalent, after preferred dividends, to $2.72 a common share, compared with 46¢ a share for the same period last year.

Phillips Petroleum Co., Bartlesville, Okla., and subsidiaries. First six months, 1946: net profit, $8,002,179.12 equal to $1.63 a share, contrasted with $14,578,404.76, or $2.96 a share, in the corresponding period a year ago; provision for federal income taxes $2,464,900, against $5,659,000.

Rome Cable Corp., Rome, N. Y. June quarter: net profit: $233,488, equal to $1.22 a share, against $122,102, or 64¢ a share, in the like period last year.

Sun Oil Co., Philadelphia, Pa., and subsidiaries. First half, 1946: net income, $4,360,212, equal, after preferred dividends, to $1.21 each on 3,446,840 common shares, compared with $11,672,439, or $3.67 each on 3,122,768 common shares, in the first six months last year.

United States Rubber Co., New York, N. Y. First half, 1946: net income, $9,906,886, equal after preferred dividends of $4 a share, to $4.15 a common share, contrasted with $7,121,720, or $2.57 a share, in the initial half last year; consolidated net sales, $231,710,008, against $268,447,897; current assets, June 30, $180,984,660, current liabilities, $56,698,188, against $167,567,570 and $57,496,647, respectively, on December 31, 1945.



Versatile!

GLYCERIZED
(LIQUID CONCENTRATE)
LUBRICANT

Whether you have a "Dust" nuisance to be corrected in treating hot rubber slabs to prevent adhesion in piling . . .

. . . . or an extruding operation that needs speeding up of tubing for the flat pan cure or continuous running . . .

. . . . or a molding problem—lubrication of mandrels and cores—belt drums—air bags—processing of insulated wire and cable—in fact, almost any lubricating need in the processing of rubber can be vastly facilitated with applications of GLYCERIZED LIQUID LUBRICANT!

. . . . when inner tubes are coated with GLYCERIZED, growth is reduced and modulus is maintained at high value with decidedly lower tensile depreciation under severe service. GLYCERIZED tends to minimize friction, permits slipping and placing into tire easily *(avoiding pinches)* with the added property of preservation and rich, satiny finish.

Glycerized is truly a Versatile Lubricant of unparalleled processing and finishing qualities for all types of synthetic rubbers as well as for natural rubber, reclaim or mixture thereof.

GET THE GENUINE from GENSEKE

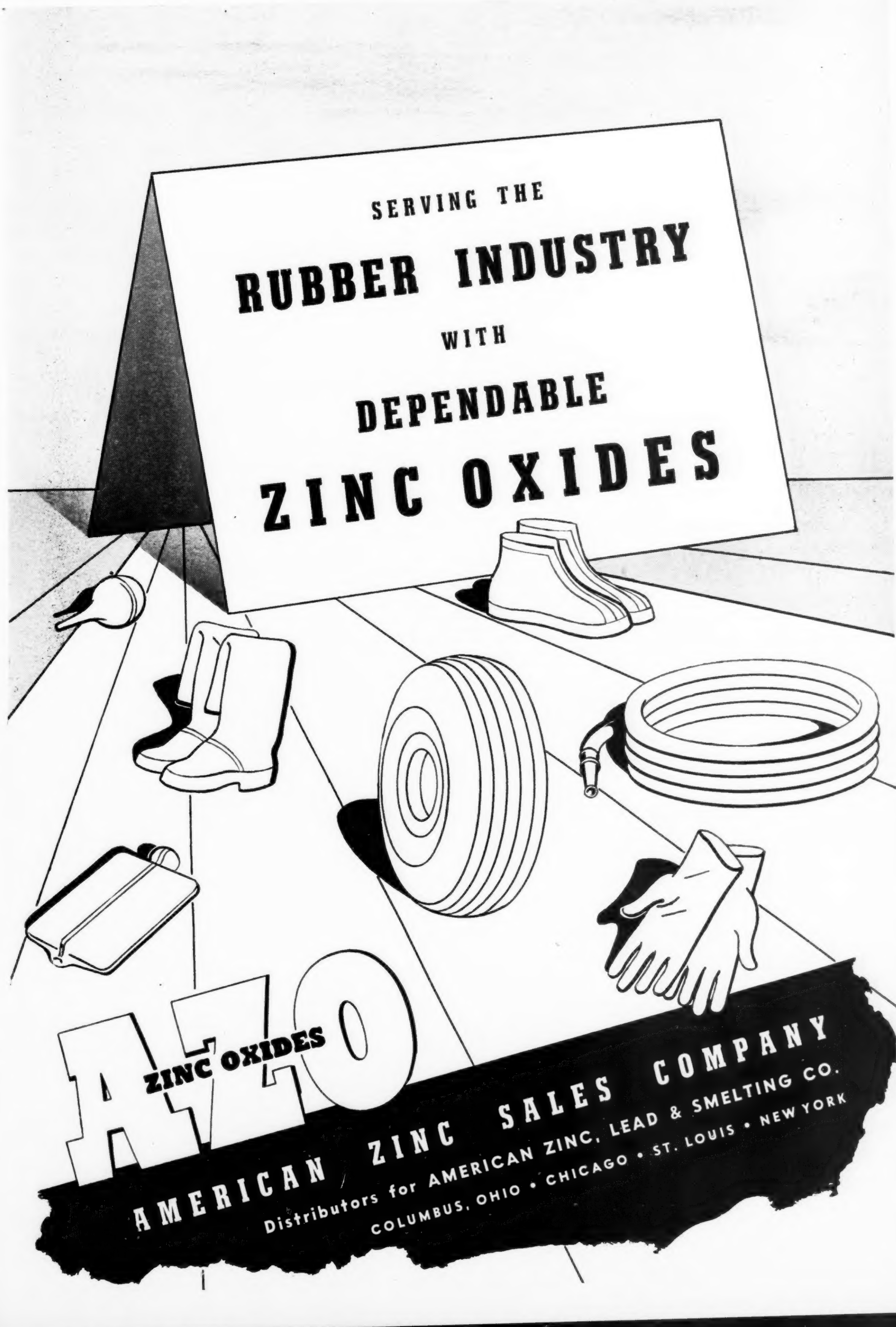
AVAILABLE ONLY IN DRUMS, HALF DRUMS AND QUARTER DRUMS

QUALITY SINCE 1884

GENSEKE BROTHERS

RUBBER MATERIALS DIVISION

West 48th Place and Whipple Street Chicago 32, U.S.A.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ALL CLASSIFIED ADVERTISING MUST BE PAID IN ADVANCE

GENERAL RATES	SITUATIONS WANTED RATES	SITUATIONS OPEN RATES
Light face type $1.00 per line (ten words)	Light face type 40c per line (ten words)	Light face type 75c per line (ten words)
Bold face type $1.25 per line (eight words)	Bold face type 55c per line (eight words)	Bold face type $1.00 per line (eight words)
Allow nine words for keyed address.	**Address All Replies to New York Office at 386 Fourth Avenue, New York 16, N. Y.**	*Replies forwarded without charge*

SITUATIONS OPEN

TECHNICAL FIELD REPRESENTATIVE: MIDWEST RUBBER concern needs man who can work with customers and plant. Must have knowledge of synthetics including latex, compounding, etc. Aptitude for development. Reply giving experience, education, family status, salary expected, and recent photograph. Address Box No. 592, care of INDIA RUBBER WORLD.

DEVELOPMENT CHEMIST, YOUNG, WITH SEVERAL YEARS' experience in rubber industry for development work on synthetic rubbers, adhesives, plastics used in fabric coatings. Excellent opportunity. Metropolitan New York Area. In reply give complete résumé and minimum salary requirements. Enclose small photo. Address Box 595, care of INDIA RUBBER WORLD.

PRODUCTION FOREMAN TO SUPERVISE PRESS LINE AND production of small rubber plant manufacturing molded and extruded rubber products. Excellent opportunity. Plant located in Philadelphia area. State experience, salary, etc. Address Box No. 599, care of INDIA RUBBER WORLD.

RUBBER TECHNOLOGIST: Graduate Chemist or Engineer with experience in either rubber processing plant or laboratory to work in Technical Sales organization of large Eastern Chemical Manufacturer. Prefer man 25 to 30 years old. Will involve limited foreign travel in future. Personality suitable for technical sales contacts necessary. State age, marital status, details of education, experience, draft status, present salary and salary expected. Address Box No. 600, care of INDIA RUBBER WORLD.

WANTED: GRADUATE CHEMIST OR CHEMICAL ENGINEER for work as assistant chemist in rubber plant located in Connecticut. State in detail in first handwritten letter: age, education, experience if any, and remuneration expected. Address Box No. 601, care of INDIA RUBBER WORLD.

FOREMAN — SUPERINTENDENT. MUST HAVE THOROUGH knowledge combining of fabrics, leathers, and plastics. Plant located New York. Exceptional opportunity. Write Box No. 605, care of INDIA RUBBER WORLD.

SITUATIONS WANTED

PLANT MANAGER OR SUPERINTENDENT. 25 YEARS OF technical and practical experience in many lines of the rubber industry, specializing in proofing of all kinds of fabrics, with natural and synthetic rubber, plastic resins, and unsupported films. Excellent knowledge of compounding in both rubber and plastic, mixing, calendering, and spreading. Capable of supervising men and production in cost and maintenance. Address Box No. 589, care of INDIA RUBBER WORLD.

SITUATIONS WANTED (Continued)

RUBBER CHEMIST—AGE 34, WILL BE RELEASED from army in September. Experienced in variety of products of synthetics and natural rubber, specializing in solvent-resisting items. Can develop and manufacture any product. Experienced in management. Business ability. Desires permanent position, preferably with remuneration based directly upon results, such as commission or partnership. Character, ability, honesty, unquestionable. Willing to pioneer. Address Box No. 588, care of INDIA RUBBER WORLD.

CHEMIST, 16 YEARS' EXPERIENCE IN RESEARCH AND development work in compounding, milling, calendering, curing of rubber, synthetic and plastic goods. Calender and spreader coating of rubbers, vinyls, cellulose coatings and unsupported films. Experienced in manufacture of pressure-sensitive adhesives, cements. Desires position of responsibility, where knowledge and experience are essential. Address Box No. 590, care of INDIA RUBBER WORLD.

RUBBER TECHNOLOGIST WITH SALES ABILITY, age 33, Ph.D. (Chemistry), 7 years' experience in natural rubber production methods both here and in the Far East, desires position, not necessarily in rubber, offering opportunity and where executive ability counts. Location immaterial. Health excellent. Married, both having had European as well as Far Eastern experience. Working knowledge of French. Willing start moderate salary provided possibilities for advancement good. Address Box No. 591, care of INDIA RUBBER WORLD.

RUBBER ENGINEER DESIRES NEW CONNECTIONS AS technical man or superintendent of production. 22 years of practical experience in the manufacture of mechanical rubber goods from natural, reclaim, and synthetic rubbers. Experienced also in plastics, resins, and latices. Well educated. Address Box No. 597, care of INDIA RUBBER WORLD.

TECHNICAL DIRECTOR; THOROUGHLY EXPERIENCED IN soft and hard sponge elastomers, latex processing, rubber bonding, synthetic organic chemicals. 20 years' supervision, direction, coordination, and pursuit of research and developments. Excellent collegiate training. Recent technical director available immediately. Residence important. Location immaterial. Address Box No. 598, care of INDIA RUBBER WORLD.

CHEMIST—19 YEARS' EXPERIENCE IN DEVELOPMENT AND supervision of production of surface coatings which include pigment dispersions, resin emulsions, ethyl cellulose lacquer emulsions, wax finishes, and adhesives. Executive caliber. Chicago area. Address Box No. 604, care of INDIA RUBBER WORLD.

(Classified Advertisements Continued on Page 744)

Classified Advertisements

Continued

MACHINERY AND SUPPLIES FOR SALE

LIQUIDATING: Land, Buildings, Machinery, Equipment, Supplies, Office Equipment of former THERMOID OF CALIF. Plant (previously Grizzly Mg. Co.) including Rubber Mills, Calenders, Tubers, Vulcanizers, Hose Building Machinery, Fabric Dryers, Hydraulic Presses, Pumps and Accumulators, Hydraulic Cutters, 500′ Cleveland Tramrail, Metal Working Machinery, Woodworking Machinery, 3 Trucks, 1-, 1½-, and 5-ton Compressors, Miscellaneous Tools, Welders, Hoists, etc. Representative on premises. Send for circular. Wire, Phone, Write—Consolidated Products Co., Inc., 637 S. Clarence St., Los Angeles, Calif. Telephone—Angeles 1-4151.

FOR SALE: Adamson 6″ Extruder. 400-Ton Hydraulic Extrusion Press, Hydraulic Presses from 12″ x 12″ to 42″ x 48″ Platens, from 50 to 500 Tons. Hydraulic Pumps and Accumulators, Mixers, etc.
WE BUY YOUR SURPLUS MACHINERY
STEIN EQUIPMENT CO.
426 BROOME ST., NEW YORK 13, N. Y.

FOR SALE—1 hydraulic press, 14″ ram, 4 openings, 24″ x 24″, Steel Platens. No dealers. Address Box No. 593, care of INDIA RUBBER WORLD.

FOR INTERCHANGE: BANBURY BODIES, NO. 9, SPRAY type, including new door top. Completely rebuilt and hard-surfaced by INTERSTATE. Interchange for your worn Banbury. Save production delay. Write or phone INTERSTATE WELDING SERVICE, 914 Miami Street, Akron 11, Ohio.

FOR SALE: 1—3A BANBURY MIXER, 1—30x30 MASTICATOR, 2—48″ mills, 2—42″ Mills, 2 new 60″ Mills, 1—3-roll 48″ Calender, 1—2-roll 80″ Embossing Calender, 6—36x36″ four opening Hydraulic Presses, 1—10 gal. W.&P. Mixer jacketed, 1—500 gal. plain W.&P. Mixer, 2—Rubber Washers, 1—Span Grinder, 2—Crackers, 2—Rubber Spreaders, 4—Churns, 1—40 gal. Pony Mixer, 1—60″ Doubling Calender, 6—Heel Trimming Machines, 1—Goose Neck Press 20″x10′ with four 8″ dia. Ram. Address Box No. 602, care of INDIA RUBBER WORLD.

ONE (1) 50″ MILL IN PERFECT CONDITION WITH 75-HORSEpower motor; one (1) union steam pump; one (1) 36″x36″ Farrel Hydraulic Press; nine (9) rubber heel molds—various sizes. Address Box No. 603, care of INDIA RUBBER WORLD.

ONE LEE STAINLESS STEEL MIXING KETTLE WITH INsulated steam jacket for 125 pounds' pressure. Working capacity 50 gallons. Mixer mounted on welded steel frame with counter shaft for individual motor drive. No motor furnished. Mixer in excellent condition. Address Box No. 606, care of INDIA RUBBER WORLD.

YOUR ASSETS and CAPITAL STOCK are WORTH MORE NOW

We are willing to **PAY YOU CASH**

For Your

·INDUSTRIAL PLANTS
·MFG. DIVISIONS or UNITS

We are principals acting in our own behalf.
All transactions held in strictest confidence.
Personnel retained wherever possible.

ADDRESS: Box 1220
147 W. 42 St., New York 18, N. Y.

COLORS for RUBBER

Red Iron Oxides
Green Chromium Oxides
Green Chromium Hydroxides

Reinforcing Fillers and Inerts

C. K. WILLIAMS & CO.
EASTON, PA.

Classified Advertisements
Continued

MACHINERY AND SUPPLIES WANTED

WANTED
Rubber Refiner
21 & 24 x 36″
or approximate
THE NORWALK TIRE & RUBBER CO.
Norwalk, Conn.

WANTED: 1 CAMERON CUTTING MACHINE, MODEL 4—D, Camachine #26, 50″ preferred. Address Box No. 594, care of INDIA RUBBER WORLD.

WANTED TO BUY: HEAVY-DUTY MIXER, VACUUM, STEAM-jacketed, working capacity—200 gallons or larger. Address Box No. 596, care of INDIA RUBBER WORLD.

BANBURY MIXER, SIZE 3A OR 9; RUBBER TUBER, TWO TO three inches, both for immediate use. APEX TIRE & RUBBER COMPANY, Pawtucket, Rhode Island.

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SALES REPRESENTATION SOUTHERN AFRICA

Well-established manufacturers Representatives, branch offices covering entire territory invites sole representation established manufacturers. Kindly communicate with principal

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AIR BAG BUFFING MACHINERY
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Molded and Extruded Specialties
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For synthetic or natural rubber, latex, or reclaimed rubber compounding: especially fine for mechanical goods.
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Box 3722, Kenmore Station Akron 14, Ohio
New England Agents, Stock Carried, Berlow & Schlosser Co.
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BABY PANTS	RUBBER SHEETS
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SANITARY WEAR	RUBBER SPECIALTIES
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RAND RUBBER CO. BROOKLYN, N. Y. U. S. A. MFRS.

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Designers and Builders of
"V" BELT MANUFACTURING EQUIPMENT
Cord Latexing, Expanding Mandrels, Automatic Cutting, Skiving, Flipping and Roll Drive Wrapping Machines.
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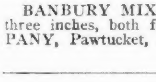
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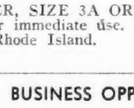

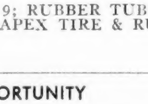
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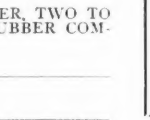

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THE DEPENDABLE SWING JOINT

Wherever a swing pipe-joint is required to convey steam, compressed air, water, oil, and other fluids through pipe lines, Flexo Joints will prove a dependable swing joint. Comes in 4 styles. Pipe sizes from ¼″ to 3″.

FLEXO SUPPLY CO., Inc., 4218 Olive St., St. Louis 8, Mo.
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that means
Select Quality
It takes skill and experience to make sense out of a heap of Scrap Rubber these days. Schulman experts know how to classify every piece . . . make sure that Natural and Synthetic types are unmixed . . . fill your order with prescription accuracy. You'll get better reclaiming results from a batch of Scrap Rubber that wears the Schulman badge of quality, the "arrow S."
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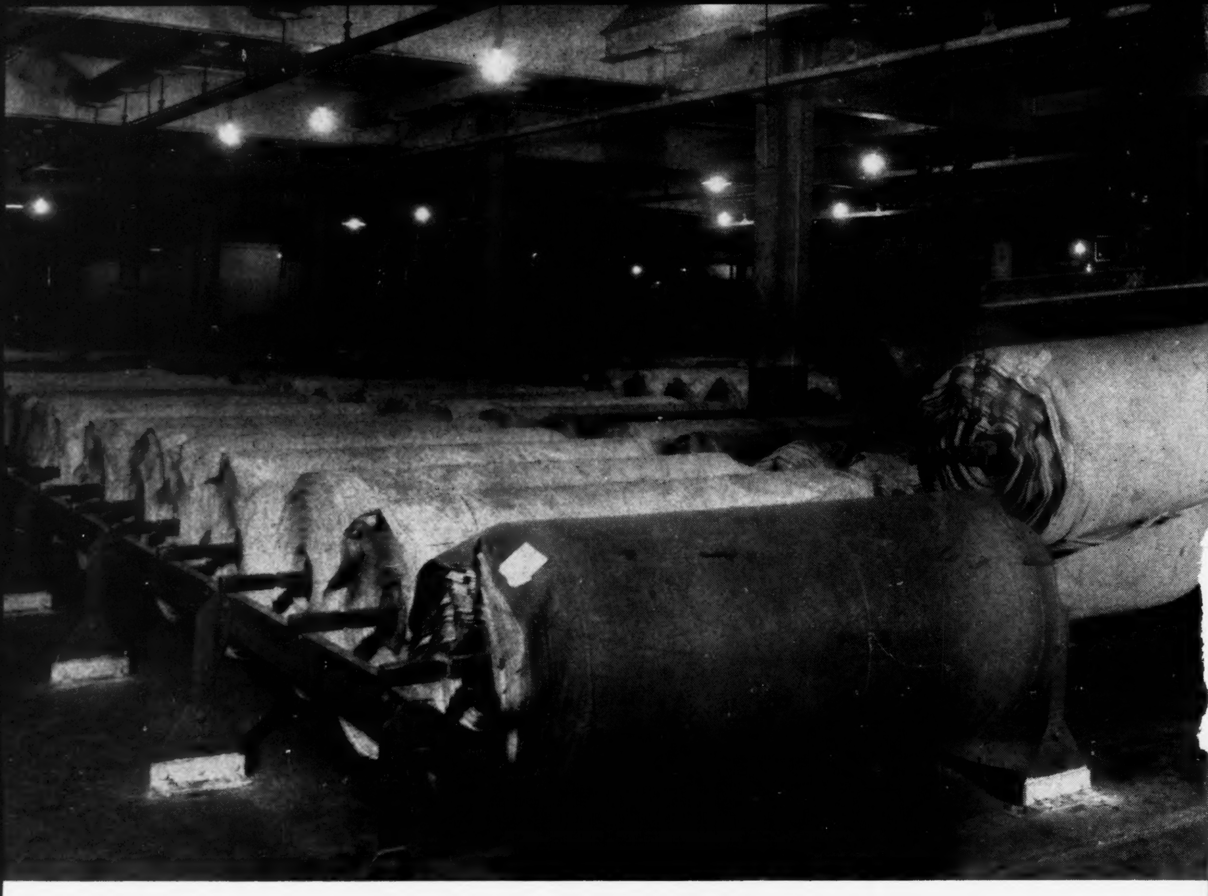
East St. Louis, Ill.
Long Beach, Cal.
New York 18, N. Y.
Boston 16, Mass.
A. Schulman Inc.
Scrap Rubber



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